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Electrical World

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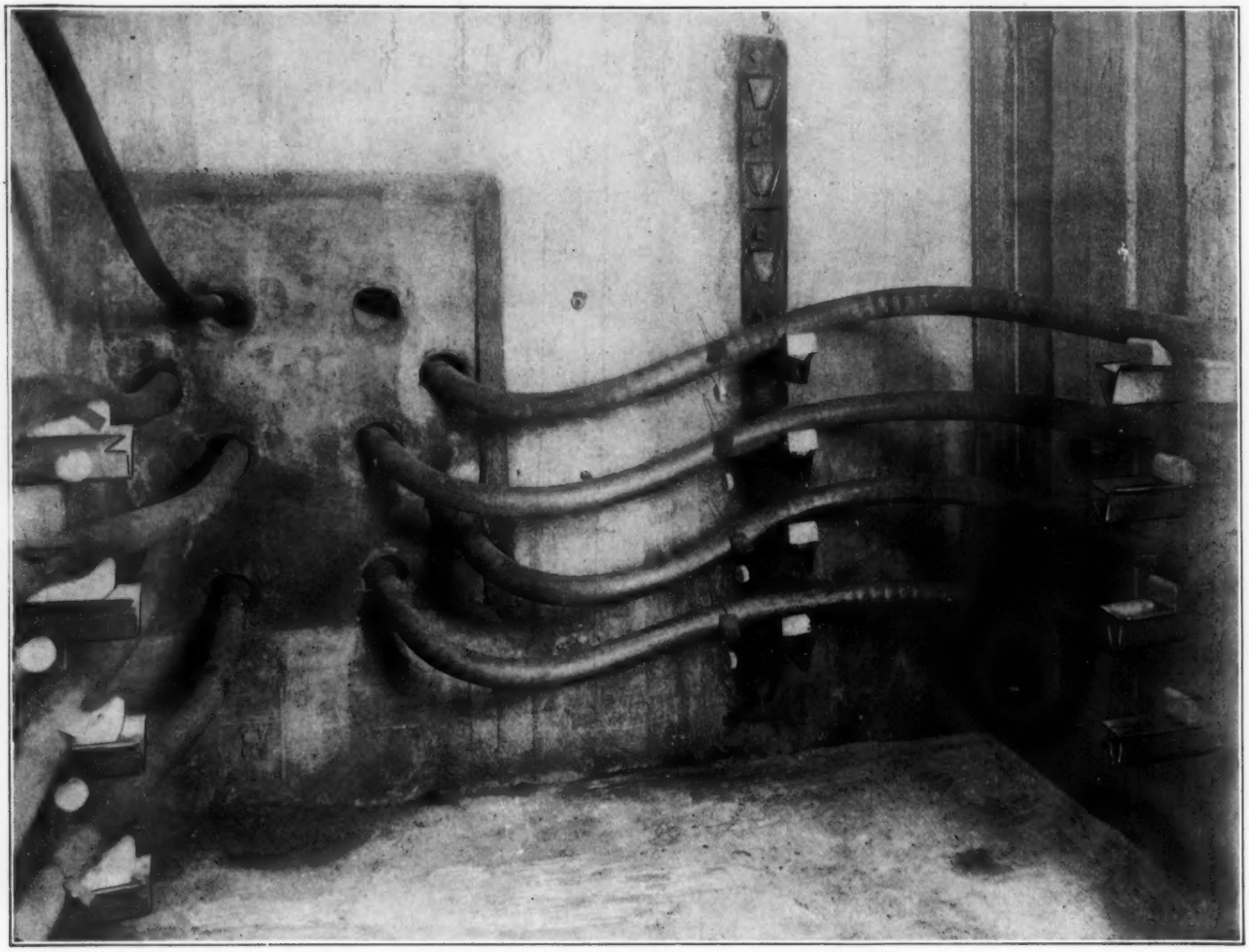

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Electrical World

Published by McGraw-Hill Company, Inc.
W. H. ONKEN, JR.
Editor

VOLUME 87 *New York, Saturday, January 9, 1926* NUMBER 2

Good Men Led Astray

THAT any great industry or any quasi-public enterprise will ever be free from misrepresentation, criticism and attack is too much to expect. Human nature is human nature, and the critical faculty or what assumes to be such is the most carefully trained function of the average brain. A shining target is ever a popular one, and every normal citizen prides himself on his ability to "see through" things—his pride being frequently in inverse ratio to his real keenness of vision. There are, however, many well-meaning and well-intentioned critics of high intelligence. The unfounded criticism and deplorable actions of such men are attributable to lack of complete understanding and knowledge. These men are sometimes violent and destructive, like Saul of Tarshis. They act on impulse and unwittingly do great harm. Once cure their mental strabismus and they will themselves be the first to condemn what they did in honest error and to set themselves to counteract its effects.

Consider, for example, the case of Senator Norris, who has just introduced a bill for government operation of Muscle Shoals. The Senator means well. He is honest and believes he is working in the public interest and that what he is doing is the proper and just thing to do. On matters of policy he is often at variance with his own party, but he is an independent thinker and his integrity is unquestioned. Senator Norris, as the electrical industry well knows, was the one man in Washington who fought the iniquitous attempt of Henry Ford to grab Muscle Shoals. Although the Southern States are far removed from his own constituency, he contended that the power from the natural resources of the Tennessee River belonged to all the people of the South and should be distributed to them rather than turned over to a millionaire manufacturer for his own private use and gain. In this he proved himself a better statesman than his Southern colleagues. He has never objected to—on the contrary, he has advocated—merging and interconnection of properties and power facilities because of the marked economies of production and distribution inherent in such consolidations. On these vital issues he sees eye to eye with the electrical industry itself. He differs from the industry, however, in that he believes these hydro-electric developments should be made and carried on by the government rather than by private industry. His judgment rather than any insincerity has led him astray here, and that is a pity, because the Senator from Nebraska has spent many laborious and studious hours seeking light on power development.

The evils of political control, the lack of initiative and enterprise involved in government operation of public utilities have been conclusively established in countries where it has been fairly tried out for years. Time has revealed that throughout Europe government operation has checked, instead of accelerated, electrical development. The electric public utilities of the United States, privately owned but governmentally controlled, have done much to perfect the art of electric generation, transmission and distribution and to increase the living standards of the American people by supplying a service cheaper and better than is obtainable elsewhere. No industry has made a greater contribution to American civilization and no governmentally owned and operated electric public utility on the face of the earth has thus far been able to approach, much less match, the wonderful achievements of America's privately owned electric public utilities. This is not a question of opinion, but a matter of fact, as government statistics and public approbation amply demonstrate. What a difference in viewpoint and thought many of America's outstanding men—and with them we class Senator Norris—would have if they were in possession of all the facts and knew their proper application!

An Exploration Period in the Electrical Era

ELECTRICAL men are busily engaged in exploring a new world. Each year they make new lines of advance and establish revelations of truth which light the ground over which they have been traveling, and the new difficulties encountered in their explorations incorporate in themselves a large part of the interest and spirit necessary for further advances. Their progress is so rapid that a reflective mind and a mountain peak are essential to a visualization of the territory discovered and that yet waiting exploration.

So once each year electrical men pause, sit back and rejoice over their accomplishments. They measure how far the hearth of civilization has been advanced and attempt to anticipate how long ideals, habits and developments can continue along the present lines. They like to applaud the magnitude of their industry and to speculate upon how greatly the present luxurious, comfortable life in America depends on the direct and indirect applications of electricity. It is astonishing that only the present generation was born to the inheritance of these good things, and it is alarming to think that the present ideal culture, the home life, the luxury, the civilization and even the fundamental outlook on life may change again just as rapidly should some new energy element supersede electricity and revolutionize the world of today.

But the future seems serene and assured. Without fear electrical men can continue to utilize natural resources, and especially fossil fuel, to produce electricity for present and future needs. The efficiency of utilization of fuel and of the production of electricity increases almost in proportion to the quantity of electricity needed in the world. New discoveries in science open a vista whereby the energy resources of nature can be tapped for the production of electricity and thus reduce the need for further depletion of natural resources. The theories of science are rapidly coming into being as facts, and the towering mentalities of Bohr, Thomson, Millikan, Rutherford and Langmuir

have crossed the borders of a scientific land which will be opened eventually for fruitful exploitation. Electrical men are assured of their place in the van in all these developments and can continue to build, to expand and to apply their energy to human needs.

Man Power—an Investment, Not an Operating Expense

ACCORDING to any accounting practice that may be considered, man power has always been considered an operating expense. From an executive viewpoint, however, should not "human equipment," if such a term can be coined, be a capital investment? Hardly an employee will be found who is not worth more to the company than when he was first engaged owing to the increased proficiency that comes not only from developed ability but from increased familiarity with the company's policies, practices, products, personnel, clients, etc. In paying these individuals many companies are prone to believe that they are paying only for work performed, overlooking the fact that part of this expense is really chargeable to building the potential ability of the man. By continued employment the employer is really increasing the rating of his "human equipment," which should be capitalized. If this were done, no employer would allow men he had trained to go to some other company at higher compensation without first asking: "How much have I got invested in the man? Can I afford to sacrifice this investment for another investment which may not bring me so good a return?"

Of course, all investments are not good investments, even in "human equipment," and it may pay to sacrifice some. However, it frequently happens that an employer will let a good employee go because some one else has bid higher for his services and then find that to replace him even with an inferior and less well-trained man a greater increase in salary must be paid than was necessary to retain the man who has left. Scrapping of "human equipment," or labor turnover as it is frequently called, is a costly practice. True economy lies in selecting good men in the first instance, giving every individual a chance to "understudy" for a higher position, and paying every one in proportion to his inherent value to the company. Then turnover will consist almost entirely of undesirable employees.

The Public Should Be Taught to Compute Cost of Electricity

TWO generations of human beings have passed maturity since electric lighting was introduced, and still relatively few persons know what a kilowatt-hour means. That this ignorance is costing the electrical industry many millions of dollars each year can be proved by any one who will make a few observations and computations. Lack of knowledge creates mystery, and from this is often born an unfair magnification of cost. Electricity for light and power is so inexpensive compared with its results that there can be no advantage in the public's inability to compute its cost. On the other hand, much should be gained from a general enlightenment.

Many electrical workers have had the pleasant experience of convincing consumers by means of simple computations that their idea of the cost of operating a lamp, a flatiron or a washer is greatly exaggerated. Perhaps only faith founded on personal acquaintance made them accept the facts which to them were astonishing. Even after such computations all doubt may not be banished, and it may gradually come back in its old strength. Indeed, it is not only the householder who is handicapped by this lack of knowledge. Superintendents of buildings, factories and offices are not familiar enough with these simple electrical terms to satisfy themselves that a 50-watt lamp will operate four hours for one cent's worth of electricity when the rate is five cents per kilowatt-hour and that this is about nine-tenths the total cost of this four hours of lighting.

The public has shown much ability in mastering many more intricate matters connected with automobiles and radio equipment. Surely it can master the kilowatt-hour. When the mysteries are dissolved and a clear view of costs obtained, the factor of expense will be largely eliminated from the public mind, because its insignificance will be recognized. There are many advantages in thus educating the public, and the electrical industry will surely see that it is done.

Rural Service Bugbears

SITTING on his front porch with a shotgun held at "ready" across his knees, and before he would permit the line gang of a certain utility company to clear a storm-blown transmission line from the trees on his property, a farmer demanded a promise in writing that electric service would be extended to him. This incident actually happened about five years ago, but this style of application for rural service could not have an enduring vogue. Like most resorts to extreme measures, it is not really necessary in the situation. It is now reasonably easy for the farmer to get electric service if he lives within striking distance of a distribution system. It is also comparatively easy to secure the co-operation of farmers in an attempt to work out an equitable and satisfactory rural service supply. Education and enlightened public relations have brought about these changes and notable progress has been made.

But there are still many utility companies that evade the rural service problem and regard with trepidation, not to say actual horror, the surely coming day when the farmer will demand as his right the opportunity to participate in the comforts and aids that electric service gives to human beings. Several reasons are back of this attitude and cause this fear. Ignorance of the possibilities of rural service, contentment with present conditions, fear of unprofitable investments, inertia and horror of the rate goblin that leers around the corner all combine to bring about an unenlightened attitude toward rural service. These utilities are missing an opportunity to establish themselves as real assets in their communities. By their opposition to rural service they are building a wall without stability, and their situation will be serious in the coming years when other utilities in other localities have marched ahead to a solution of the rural service problem and they have been left behind to meet the blows of a dissatisfied public.

Every far-seeing utility will co-operate with farmers to the utmost in order to develop rural service. Farmers are intelligent beings, and if financial handicaps in specific cases prohibit rural service, they will be willing to recognize the facts. If rates need adjustment and

the new rates are based on a sound economic analysis, the farmers will approve them. There is nothing to fear in the rural service business if co-operation, initiative and vision are brought to bear. There is much to fear if utility companies do not help to bring about rural electric service.

Wasted Opportunities

REGARDLESS of how they are painted, what a splendid medium truck fleets represent for carrying messages of good will to the public! The central-station companies of the country operate in the aggregate a very large fleet of motor vehicles. These trucks are constantly in motion over the streets and highways of the communities which are served with electric light and power. Some companies have taken pains to paint their trucks in such a way as to make them as inconspicuous as possible. Others have adopted the opposite policy of painting them with vivid and easily recognized designs.

At the present time the utility companies are spending thousands of dollars on pamphlets to be used as envelope stuffers with bills or to be distributed by meter readers, carrying to their consumers a message of service, reliability and low rates. Why not organize a movement to mount on the sides of all motor vehicles operated by central-station companies poster bulletin boards and through some centralized medium arrange for the monthly distribution of lithographed posters carrying the messages which the utilities desire to get, not only to their patrons, but to every one on the streets of their community? By pooling a large number of trucks and taking advantage of mass production, attractive art work and designs could be furnished at a low cost.

Is not this just another of the wasted opportunities which confront the industry on every side and which if seized and turned to account would be a potent factor in better public relations?

Lighter Skies in Maine

SLOWLY but surely the tide of public opinion in the Pine Tree State is turning in favor of a more liberal policy in regard to the exportation of surplus hydroelectric power. The people are listening more sympathetically to engineers, public utility men and other counselors who see in a continuance of the old policy of isolation in power development and its limitation to intrastate use only a brake upon progress and a real obstacle to the investment of many millions of dollars in the taxable hydraulic works, electric plants and transmission lines demanded by a comprehensive program to serve the northeastern market to the limit of Maine's resources in competition with neighboring localities within striking distance of the Atlantic seaboard.

The popular appeal of the Passamaquoddy tidal development project was one important factor in relaxing public opposition to power exportation in connection with the Cooper scheme. Voices are being heeded that have for some time been pointing out the economic unwisdom of letting the rivers run to waste while waiting for industries to move into the state when other regions are calling for power and developing it for interstate service. On the farms the desire for electric service at low cost is coming to be associated with a better understanding of the limitations imposed by the present non-exportation law, and in the cities it is good to see intelligent opinion making rapid headway against the appeals to demagogism which long since befogged this great problem in the public mind. The granges are getting a clearer view of the situation, and in some quarters a special session of the Legislature is being urged to revise or repeal the existing prohibitory statute.

Whether such a session is held this winter or not, there is no question that the merits of the matter are now being discussed more appreciatively by the electorate of the state than at any time since the passage of the act in 1909. Much remains to be done before the last mist of misunderstanding capable of blocking advance to the goal of repeal is swept away, but the outlook is indeed encouraging to all believers in the economic co-ordination of water powers.

The Controversy Over New Wiring Materials

THERE has been long-continued controversy among electrical men over the procedure that should be followed in admitting new products for use in electric wiring. This controversy has been renewed recently, largely because of the appearance on the market of a new type of unarmored wire assembly now produced by more than one manufacturer. The discussion has embraced also the idea of the all-metal standard which has been advocated by the contractors and decried by the wiring committee of the National Electric Light Association. The issues involved in this whole question involve many technicalities and traditions, and the average man is apt to be a bit bewildered. Under it all, however, stand out these four principles to which any fair mind will subscribe:

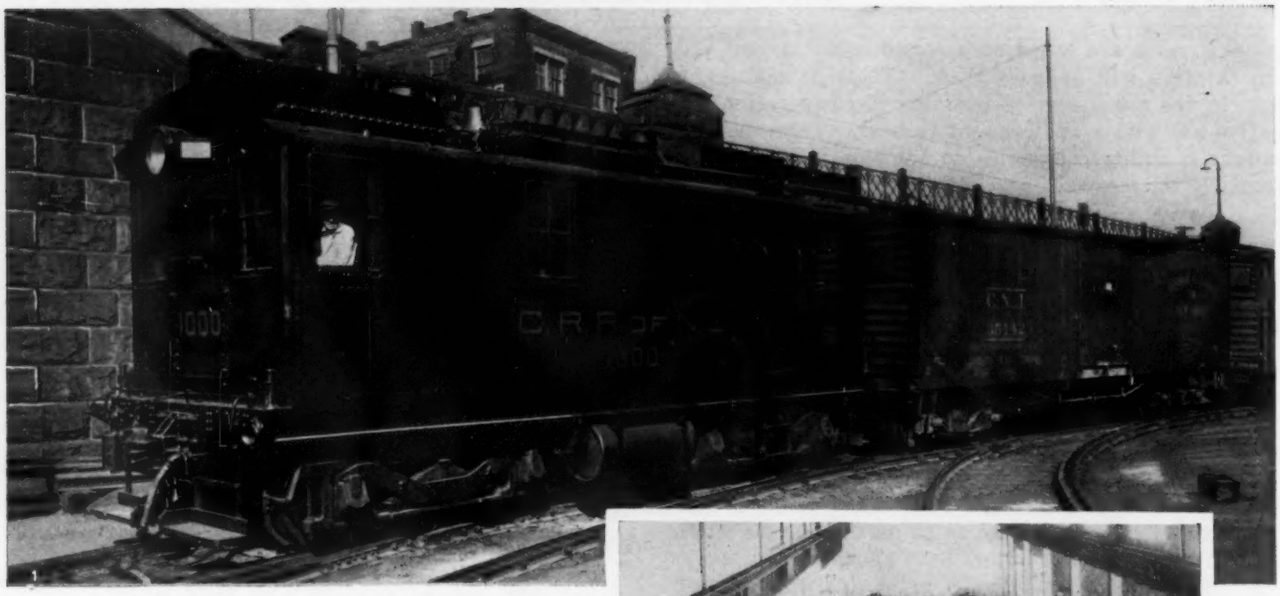
1. The National Electrical Code and the National Electrical Safety Code, having been established as American standards under the regulation of the American Engineering Standards Committee, are no longer merely the instruments of the fire insurance underwriters nor the property of the electrical manufacturers, the contractors or the inspectors. Their function is neither to defend established products nor yet to restrict or assist new products, but solely to provide and maintain adequate protection for the American public in step with the advancing art.

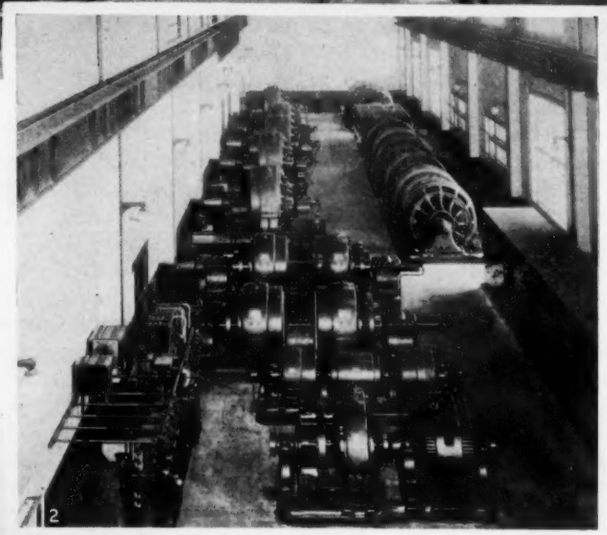
2. The testing of new materials as acceptable in these codes should be from the sole standpoint of determining the fire or casualty hazard involved in their use when the material is installed in accordance with the code.

3. Specifications for such test should deal with the purpose and the methods of the test, but not with the construction of the material, the issue being not its structure but its safety and dependability in the performance of its function.

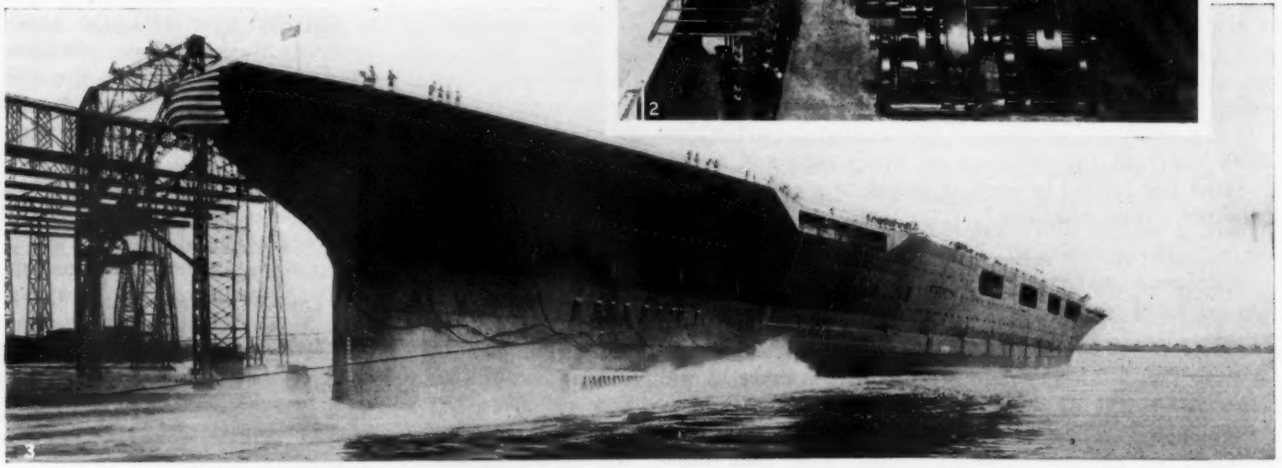
4. New materials should be approached, not for the purpose of proving them good or bad, right or wrong, but by an orderly procedure to determine their fitness for admission for use under the code.

If these four principles were clearly understood and universally accepted, there could be little basis for disagreement over new products. Men would naturally withhold judgment until proper tests were made and then abide by the results.





Electricity's Aid Invoked in Many Industrial Fields



ELECTRICAL application has penetrated into all industries and all businesses because of its adaptability and usefulness. New applications occur yearly and no bounds appear to be set for a still wider recognition of electrical energy as the primary power source.

No. 1—An oil-electric locomotive developed by the American Locomotive Company, the General Electric Company and the Ingersoll-Rand Company. This type of unit is used for terminals, branch lines and switching service.

No. 2—The steel industry has practically become electrified. View of a steel mill which uses 13,500 kw. in synchronous motor-generators and 14,600 hp. in main roll direct-current motors.

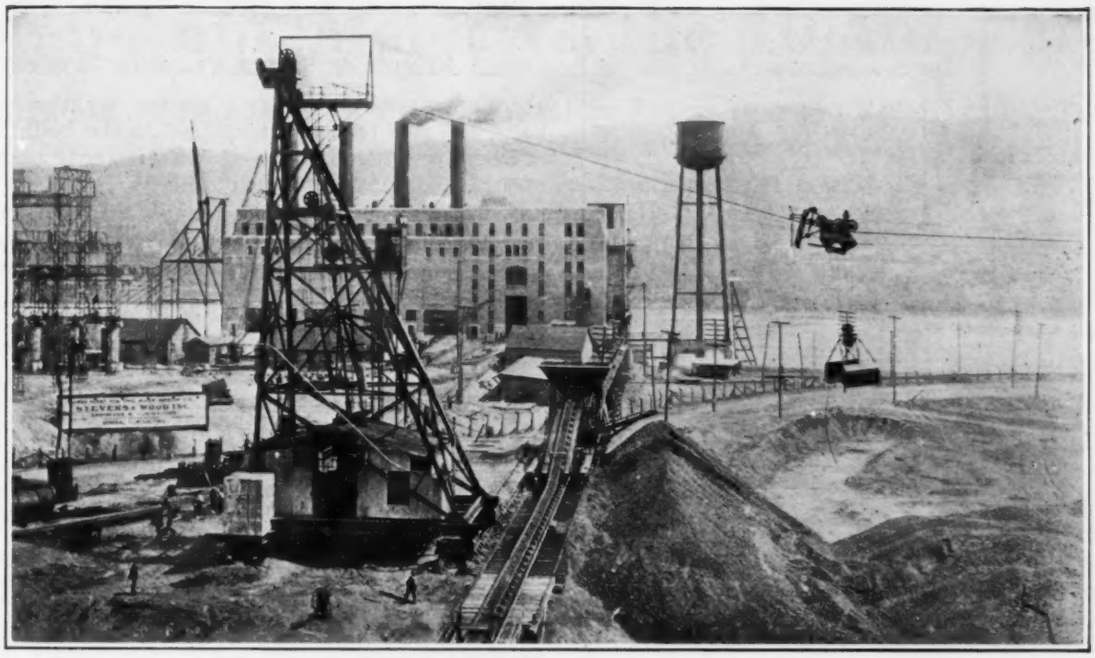
No. 3—A power plant of 180,000 hp. on the Lexington. Four 35,200-kw. steam turbo-generators supply energy to eight 22,500-hp. propeller motors.

No. 4—Shovel manufacturers have rapidly adopted electric drives during the past few years. A view of a monster electric shovel with a 90-ft. boom and a 10-cu.yd. dipper.

Modern Coal-Handling Equipment

Designed to Cut Labor Cost for Power Stations and Insure Continuous Coal Supply—Description of the Electrical Equipment Used in a Modern Station

By ERNST ZEUTHEN
Stevens & Wood, Inc., New York



VIEW OF STORAGE-YARD EQUIPMENT

THE coal-storage arrangement and transit methods employed in the Toronto plant, recently completed for the Ohio River Edison Company, contain unusual features that have proved successful in operation. The initial capacity of the plant, 66,000 kw., calls for 750 tons of pulverized coal daily, but when the ultimate capacity of 264,000 kw. is installed the demand will increase to 3,000 tons per day, and the coal-handling equipment has been designed by the engineers in charge for this ultimate capacity.

The principal source of supply is a strip mine located in the hills about four miles from the plant and operated by the Ohio River Edison Coal Company. Two 300-ton steam-driven stripping shovels uncover the coal, each shovel having a capacity of 6,000 cu.yd. per day and a 90-ft. boom. A smaller shovel digs the coal, which is passed over a picking belt, where slate, rock and foreign material are removed before it is loaded in standard hopper bottom cars, hauled by a Shea steam locomotive on a single-track road. At the power plant the coal is dumped in a 400-ton hopper, which at present is the receiving point for all coal delivered by rail. The coal leaves this hopper via a crusher and an automatic coal-sampling device and is sent to the boiler house bunkers or to the storage yard by a system of belt conveyors having a capacity of 250 tons per hour.

A second receiving station has been provided which facilitates the delivery of coal by barges docking alongside the power plant. This coal is handled by means of a four-ton grab bucket which discharges into a 150-ton hopper, from where the coal is delivered to the belt conveyor system. The following routing is available:

1. Coal from the 400-ton track hopper to storage yard.
2. Coal from the 400-ton track hopper to boiler house bunkers.
3. Coal from the 150-ton river hopper to storage yard.
4. Coal from the 150-ton river hopper to boiler house bunkers.
5. Coal from storage yard to boiler house bunkers.

Operations Nos. 1 and 4 can be carried on simultaneously, in which case four men constitute the complete coal-handling crew. With only one of the five routes in operation at a time, three men make up the crew. As the maximum demand of fuel for one load cycle is handled in a maximum of eight hours, the labor-saving feature of this system is noteworthy. The storage yard equipment consists of two traveling towers spaced 725 ft. apart, connected by a cableway, on which a three and a half-ton grab bucket is operated for distributing or reclaiming the coal, the connection with the belt conveyor system being handled with a stocking and reclaiming traveling tripper. The travel of the towers covers at present 300 ft., affording a storage capacity of 60,000 tons of coal stored to a depth of about 15 ft. As the station grows, the tower tracks

can be extended up to 800 ft. and the depth of the stored coal increased to 50 ft. The storage space can be surrounded by a berm, if that should be necessary, to permit flooding for the prevention of spontaneous firing.

Extreme simplicity distinguishes the electrical equipment, the general features of which can be summarized as follows:

All motors are induction type, three phase, 60 cycles, 440 volt or 2,300 volt, the dividing line established at

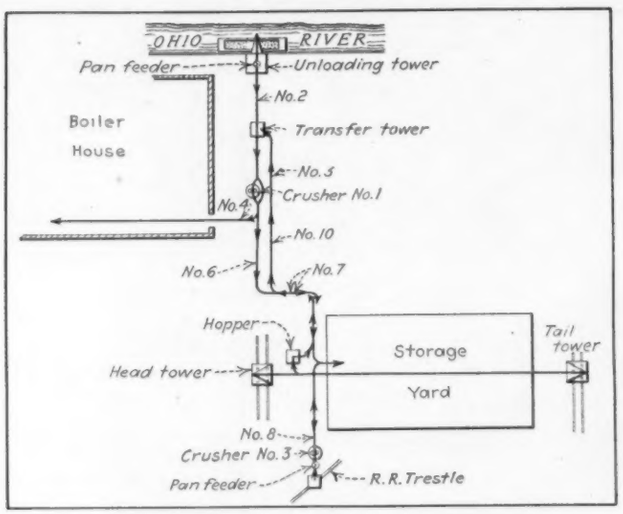


DIAGRAM OF COAL-HANDLING SYSTEM

40 hp. started on full voltage without any starting compensators.

The constant speed motors (for belt conveyors, crushers, etc.) are of the squirrel-cage type; the variable speed motors (for hoists and winches) are of the slip-ring type.

All brakes and clutches are operated by compressed air with remote electrical control.

The storage yard towers with the cableway bucket are controlled from a cab located on the tower at the belt conveyors known as the head tower. One 400-hp. motor operates the grab bucket through its complete cycle, besides furnishing traction power for the tower known as the tail tower. As this tower is shifted comparatively infrequently, the clutching arrangement is handled manually. The head tower, however, can be shifted by means of a 75-hp. winch controlled from the cab.

For the time being, power is transmitted to the head tower through cables suspended between a pole (about 150 ft. from the track) and the movable tower. A sag varying with the position of the tower affords sufficient flexibility. This arrangement is giving satisfaction, but will of course be replaced by trolleys on rails or wires when the tower track is extended.

The coal tower on the dock known as the unloading tower is stationary, as it was found more economical to provide for shifting the barges in the process of unloading coal. A barge shifter driven by a 35-hp. motor controlled from the cab serves this purpose. The grab bucket on this tower is operated by a 200-hp. hoisting motor and by a 75-hp. racking motor, but the operator in the cab controls the bucket through the complete cycle of operation without removing his hands from the operating levers. The cabs for operating the coal towers are electrically heated, and floodlight illumination has been provided for the whole outdoor system so as to make operation possible under all conditions.

The crushers are belt-driven multiple roll and adjustable to various sizes of coal, the present size being 1¼ in., in which condition it is stored in the boiler house hoppers until claimed for the pulverizer plant. In addition to the standard overload relay protection of the crusher motors, shearing pins are used to disconnect the crusher drums from the drives should any foreign matter stall a crusher. A centrifugal device was constructed to trip a contact so that the flow of coal to the crusher is stopped when a shearing pin breaks.

A Number of Safety Features Developed

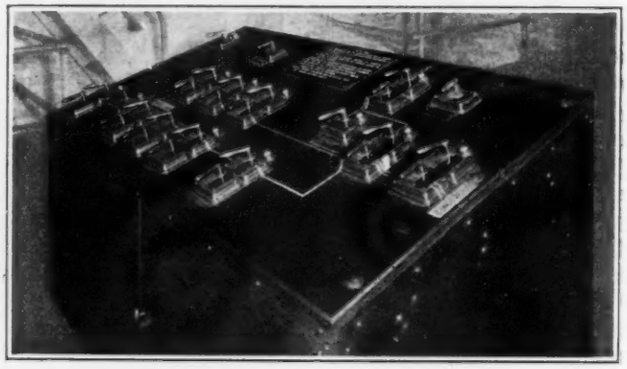
In arranging the control system for the conveyor belts, the pan feeders which feed to the belts and the crushers, the following safety features have been developed:

1. To prevent failure of a single unit from causing coal to pile up, which, at the rate of more than four tons per minute, in a few moments would mean great confusion and delay, the control system has been so connected that any stalled device will trip all the coal-handling apparatus ahead of it, thereby instantly stopping the flow of coal toward the defective point.

2. The control circuits have been interconnected so that the equipment can be started up only in the correct sequence. Taking, for instance, route No. 4 and referring to the diagram, the operator must start conveyor No. 4 first, then crusher No. 1, belt No. 2 and at last the pan feeder in the unloading tower. In this manner all the equipment in question is running before the flow of coal is actually started. This sequence interlocking was accomplished by a simple arrangement of auxiliary contact connections on the circuit breakers without the disadvantage of relay complications.

3. A trip bus is installed paralleling all conveyors with emergency stop switches located at suitable intervals. To trip any switch stops the whole system.

4. A double set of control switches has been furnished for this system, both sets being subjected to



CONTROL BOARD FOR ELECTRICAL EQUIPMENT

the sequence operation. One set of control switches is located at their respective motors. The other set is grouped on a central control desk, arranged in a comprehensive way consistent with the physical layout of the conveyor system and provided with indicating lamps, so as to afford a ready picture of the conditions of the system at all times. Colored lines connect the control switches, giving the several routes individual designa-

tions. On this control desk is also located two throw-over switches, of the dead front type, for the setting of route selection, and a plate with brief operating directions. As in the case of all similar equipment for the Toronto plant, the coal-handling control desk was assembled, wired and shipped by the manufacturer as a complete unit. The vertical sections of this desk are of steel and inclose the conduit connections totally. The terminals are accessible through doors in the front of the desk. Lead-covered multi-conductor cables in galvanized iron conduit have been used throughout for both power and control wiring. Rugged, dustproof condulet switches were used for the control system. This equipment was the first apparatus put in service in the Toronto plant and has now been operated daily with great smoothness for nine months. No alterations have been found desirable nor have any major repairs been required.

The 5-Amp. Meter vs. the 10-Amp. Meter

Investigation by Representative Central Station Shows that 110-Volt, 5-Amp., Two-Wire Meter Is Still Adequate for Average Residential Customer—Meter Selection Needs Watching, However, in Relation to Loads

By T. F. BREITHAUPT
Connecticut Light & Power Company, Waterbury, Conn.

THERE has been considerable comment of late regarding the use of 10-amp. meters in place of 5-amp. meters, and it has been suggested in some quarters that a 7.5-amp. meter be manufactured. The adoption of the 10-amp., 220-volt, three-wire meter as the minimum for three-wire, 220-volt service appears justified by experience; but a study of the loading conditions of 5-amp. meters for two-wire service indicates that on our system the time has not yet come for changing to the higher rating.

Five years ago our company practice was standardized as follows: Self-contained meters were limited to 75-amp. rating, using current transformers above this capacity; on all meters above 550 volts, current and potential transformers were required; standard 5-amp. meters were used with current or potential transformers or both, this company applying proper constants; the purchase of 220-volt, two-wire meters was discontinued, as was the buying of 5-amp., 220-volt, three-wire meters, and four types of demand metering were established to cover all requirements, with a minimum meter stock.

Service Conditions

Our service rules and requirements specify, among other things, that:

Before purchasing equipment or starting construction of facilities to be connected to the company's lines it is important that the consumer take up with the company the character of service available and its proposed application.

When a change is to be made in the consumer's installation, the company shall be notified in advance, so that it may give the matter prompt and proper attention.

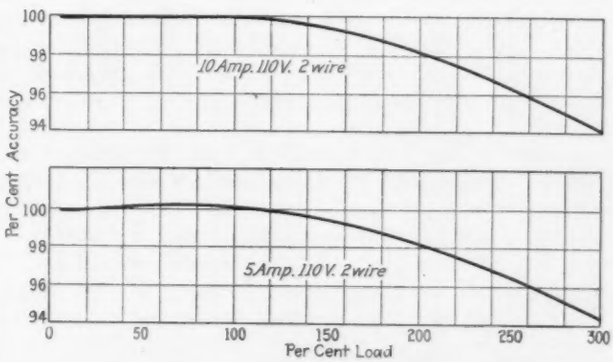
The company will hold the consumer liable for any damage to its equipment, or other loss caused by unauthorized changes in the size or nature of its connected load.

For ordinary lighting service the company supplies single-phase, sixty-cycle current, two-wire at approximately 115 volts, and three-wire at approximately 115/230 volts.

Two-wire services are supplied for installations consisting of not more than three consumers, fifty sockets or 1,500 watts of demand.

Three-wire services are supplied for installations consisting of more than three consumers, or more than fifty sockets, or more than 1,500 watts of demand. Connected loads on this class of service shall be balanced.

Two-wire meters will be used for consumers whose connected load does not exceed fifty sockets, or when the demand does not exceed 1,500 watts.



ACCURACY OF 5-AMP. AND 10-AMP. METERS AT VARIOUS LOADS

Three-wire meters will be used for consumers whose connected load exceeds fifty sockets, or the demand exceeds 1,500 watts. The connected load on each meter shall be balanced.

For service to supply mixed loads consisting of light, heat and power, or any combination thereof, where any single device to be used requires an excess of 1,500 watts, the company will, in each case, specify the class of service to be used.

From the above it may be seen that service requirements tend to classify consumers as to connected load and demand and that these requirements automatically take care of part of our problem. In other words, a meter is installed to meet the estimated demand of the consumer: For instance, on a two-wire, 115-volt service a 5-amp., 10-amp. or 15-amp. meter may be installed, according to the estimated demand. This method of determining meter capacities required holds for all classes of service.

Burn-outs of meters due to overload during a period of ten years have been less than 0.1 per cent a year. The question of burning out of meters, then, does not affect this discussion, as neither the 5-amp. nor the 10-amp. meter will burn out with 300 per cent to 400 per cent overload.

The maintenance of a 10-amp., 110-volt meter is only a little more than that of the 5-amp., 110-volt, two-wire, meter, and there is only a slight difference in the first

cost between the two meters; therefore it is not entirely the cost of meters and maintenance that should influence decision. The effect on revenue is also an important factor.

From data submitted by our new-business department, residential lighting consumers may be divided as follows:

	Per Cent
Lighting only	10
Lighting and various small appliances	85
Lighting and appliances of 1,000 watts or over	5

Most "lighting only" consumers are easily taken care of with the 5-amp. meter. The larger lighting consumers, or the 5 per cent group, are usually taken care of (see requirements quoted above) by large-capacity meters and three-wire services.

Average Meter Loads

It is, then, with the 85 per cent group of consumers that we are concerned in this discussion of the use of 5-amp. and 10-amp., 110-volt, two-wire meters. Table I gives daily demand readings taken at random on consumers with considerable appliance load and consumers with large monthly kilowatt-hour consumption on 5-amp., 110-volt, two-wire meters; the demands as given represent kilowatts integrated over fifteen-minute periods.

From the table it is obvious that the loads of consumers of this class are diversified, an average demand being 0.4 kw., or about 70 per cent load on a 5-amp., 110-volt meter, at which load the meter operates above the 100 per cent line. A low demand is 0.18 kw., or about 30 per cent load on a 5-amp., 110-volt meter; the meter at this load operates above the 100 per cent line of accuracy. The highest demand is 0.86 kw. or about 150 per cent load on a 5-amp., 110-volt meter; the meter at this load operates just below the 100 per cent line.

With an assumed demand of 1.15 kw., or 200 per cent load on a 5-amp., 110-volt meter, the meter operates 1.8 per cent below the 100 per cent line. This period of overload is usually of short duration and very seldom if ever occurs on the service of the class where 5-amp., 110-volt meters are used. However, the practice is each year to increase the purchase and use of 10-amp., 110-volt, two-wire meters to take care of the consumers who increase their consumption and demands to this point, which is out of the 5-amp. meter class.

TABLE I—DAILY DEMAND READINGS

Kw.	Amp. Equivalent	Kw.	Amp. Equivalent	Kw.	Amp. Equivalent
0.32	2.78	0.258	2.24	0.43	3.7
.28	2.53	.3	2.6	.42	3.65
.34	2.95	.39	3.4	.29	2.5
.18	1.56	.342	3.0	.18	1.56
.31	2.7	.288	2.5	.22	1.9
.67	5.8	.3	2.6	.45	3.9
.34	2.95	.24	2.1	.8	6.95
.22	1.9	.36	3.1	.25	2.18
.25	2.18	.22	1.9	.86	7.48
.324	2.8	.53	4.6	.24	2.1
.53	4.6	.65	5.65	.37	3.2
.34	2.95	.34	2.95	.21	1.8
.12	1.04	.54	4.7	.16	1.4
.45	3.9	.37	3.2	.69	6.0

A further check from the ledgers shows the average consumption of this 85 per cent group of lighting consumers, most of whom have 5-amp. meters, to be between 30 kw.-hr. and 40 kw.-hr., with a maximum of 60 kw.-hr. per month. This means from 1 kw.-hr. to 2 kw.-hr. per day spread over a twenty-four-hour period, during which the loads are well within the accuracy curve of a 5-amp. meter. It would appear, therefore, that the time has not yet arrived to purchase 10-amp., 110-volt, two-wire meters exclusively in place of 5-amp., 110-volt, two-wire meters.

There has been some discussion in certain meter committees relative to asking for the manufacture of a 7½-amp., 110-volt, two-wire meter. At best this solution of the 5-amp. and 10-amp. meter problem is only a compromise and should be discouraged. This proposed 7½-amp. meter would involve the use of constants, gear ratios and rotating test meters not standard at present. We believe the next logical step from the 5-amp., 110-volt, two-wire meter to be the 10-amp. meter.

Meter and Distribution Transformer Diversity

A study of a few secondary networks in our outlying sections showed that for every 15 kw. of transformer capacity installed about seventy 5-amp. meters were installed, or 35 kw. in metering capacity to 15 kw. in transformer capacity. This ratio, due to diversity, seems reasonable, while if the meter sizes were increased to 10 amp., the ratio would be 70 kw. in metering capacity to 15 kw. in transformer capacity, which would appear entirely out of proportion.

DATA FROM COMPANY METER RECORDS

5-amp., 110-volt meters installed Dec. 31, 1924	49,787
5-amp., 110-volt, two-wire meters purchased during 1924	6,517
10-amp., 110-volt meters installed Dec. 31, 1924	2,970
10-amp., 110-volt, two-wire meters purchased during 1924	418
5-amp., 220-volt, three-wire meters installed Dec. 31, 1924	550
5-amp., 220-volt, three-wire meters purchased during 1924	0
10-amp. 220-volt, three-wire, meters installed Dec. 31, 1924	1,130
10-amp., 220-volt, three-wire meters purchased during 1924	200

DATA SHOWING COMPANY'S PURCHASE OF 10-AMP., 110-VOLT, TWO-WIRE METERS

Prior to 1923	Less than 100 per year
During 1923	100
During 1924	418
4 months 1925	250

DATA FURNISHED BY A LARGE METER MANUFACTURER

	Per Cent
Production of 5-amp., 110-volt, two-wire meters	80
Production of 10-amp., 110-volt, two-wire meters	10
All other meter sizes	10

These data are given merely to show the trend of central-station meter practice.

So far we have not discussed the 5-amp. or 10-amp., 220-volt, three-wire meter.

Our experience with meter burn-outs due to overload has been confined mostly to the 5-amp., 220-volt, three-wire class. This meter has more ampere-turns in the current coils than most other meters and heat is generated at times faster than it can be dissipated. The turns of the current windings also have a 220-volt difference of potential between them. These conditions, we believe, cause the 5-amp., 220-volt, three-wire meters to burn out when subjected to comparatively small overloads for any length of time; hence the adoption of the 10-amp., 220-volt, three-wire meter as the minimum for three-wire, 220-volt service.

To sum up, we believe the 5-amp., 110-volt, two-wire meter is still within the accuracy and capacity required for the average residential lighting consumer, while each year more 10-amp., 110-volt, two-wire meters will be used. To safeguard revenue, in our opinion, a greater effort should be made to place the right size meter in each installation, rather than purchase and use 10-amp. meters to the exclusion of the 5-amp.

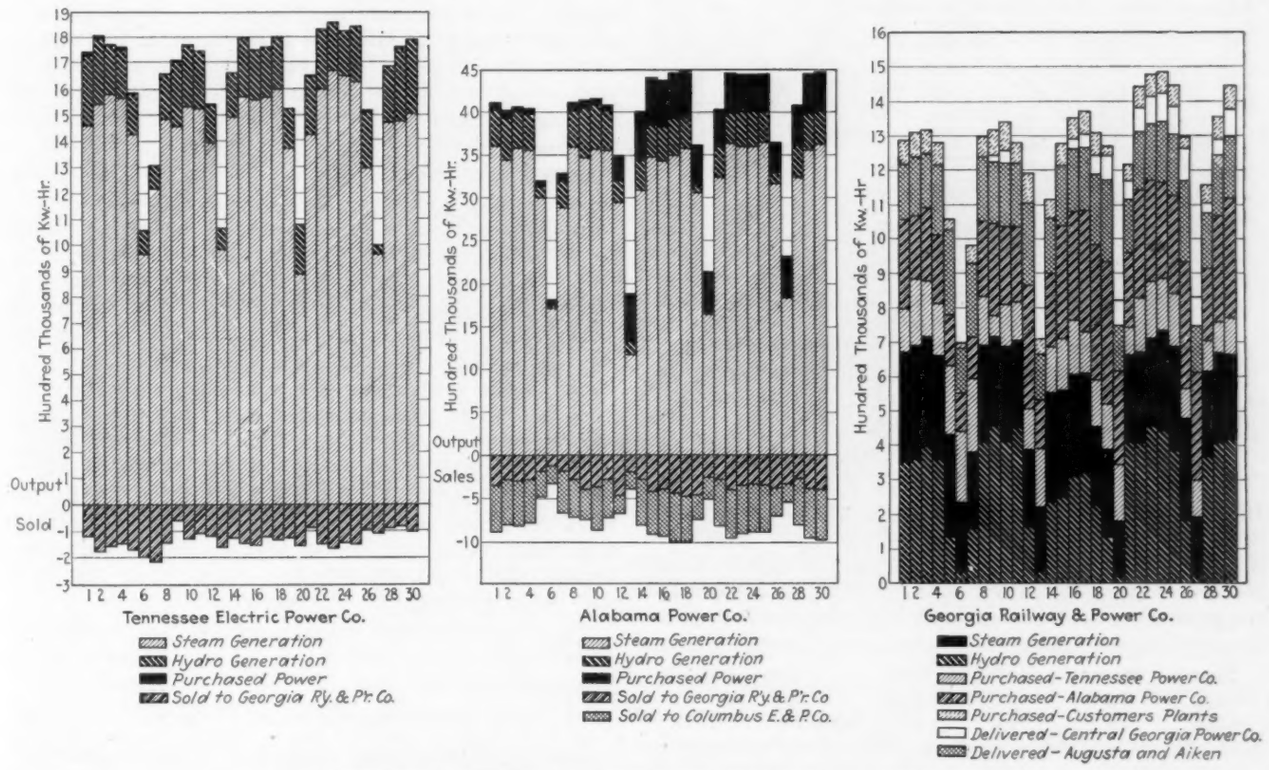
Interconnection Saves South

A Water Shortage of Unprecedented Magnitude Is Met by Utility Executives Through Pooling Generating Resources and Interconnecting Their Systems—Details of Operations and Future Plans

A VERY serious water shortage occurred last year in the southern Appalachian region, and utility executives were forced to utilize the utmost possibilities in generation and interconnection to give service to their customers. The shortage was met by the transfer of energy among properties and the utilization of steam reserves. At all times service was rendered on a 100 per cent basis by nearly every utility in the large interconnected group.

The shortage occurred in greatest degree in the that the Tennessee Electric Power Company generated 90 per cent of its energy from steam plants last year, whereas under normal conditions 90 per cent of the energy is generated from hydro plants.

In general the Southern utilities operated in two groups during the shortage. The Tennessee Electric Power Company and the Alabama Power Company supplied energy to the Georgia Railway & Power Company and other utilities in Georgia. In the second group the Southern Power Company and the Carolina Power &



SEPTEMBER CONDITIONS IN TENNESSEE, ALABAMA AND GEORGIA

At left, energy output of Tennessee Electric Power Company during September. Purchased energy was largely a pump-back effect due to voltage conditions. All interconnected energy was metered on the high-tension side of transformers. A slight amount of energy was purchased from the Aluminum Company during the first week in September.

In center, energy output of Alabama Power Company during September. A large part of the purchased steam energy was from customer plants and for resale to adjacent properties.

At right, energy purchased, generated and relayed by the Georgia Railway & Power Company during the month of September.

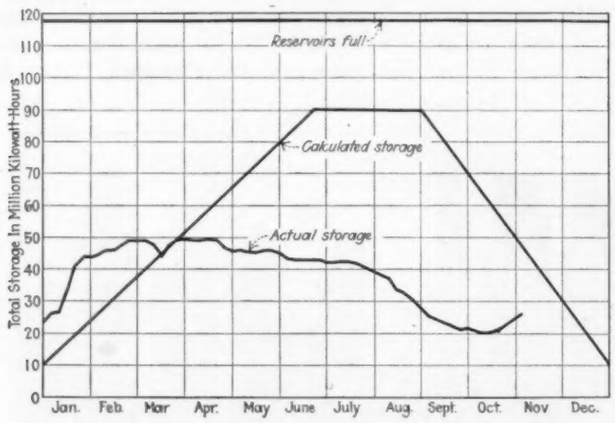
Carolinas and Georgia, and the utilities in Tennessee and Alabama were fortunate in being able to serve their own customers and in addition to aid their neighbors. It speaks well for utility managements that properties which normally generate most of their output from water-power plants were able to reverse this ratio when the water shortage occurred. What the shortage meant in the Carolinas may be visualized when it is stated that the Southern Power Company had built its system reserve on a 50 per cent margin over known low water conditions. Yet the water flow was so low last year that this margin was exceeded. It is also interesting to note Light Company operated with other utilities in the Carolinas to take advantage of all possibilities in generation. Each utility in the large interconnected system started every possible reserve station and customer steam stations and operated them at maximum rating. Needless to say, each utility staff was in a state of nervous tension during the whole period, for the loss of one unit or of a small amount of water meant a great deal from a service standpoint.

It should be stated that many of the utility properties are still in the development stage in their generating program. Storage basins and complete river controls

have not been made on many properties, and under these conditions stream flow plants were placed entirely out of commission during the shortage. Steam reserve stations also have not been built in comformity with the ultimate power program on many properties. It is therefore very creditable to the utility executives to find service rendered under the unprecedented conditions encountered last year. Also it is a tribute to the managements to find that very few if any changes are being made in the development program of any utility despite a water shortage that does not occur in such severity once in 60 years.

WHAT HAPPENED IN TENNESSEE

The Tennessee Electric Power Company had a system generating capacity of 103,790 kva. in steam plants and 131,030 kva. in hydro plants and in addition 9,560 kva.



STORAGE REGULATION CHART OF GEORGIA RAILWAY & POWER SYSTEM

No water should be drawn from storage reserves on Tallulah River when the total storage expressed in equivalent kilowatt-hours at Terrora, Tallulah, Tugalo and Yonah plants is below the figures indicated by calculated storage line except by specific authority. Actual storage during last summer is shown.

in leased steam plants during last summer. Under normal operating conditions this company generates about 90 per cent of its yearly energy from hydro plants. These annual percentages were as follows for the past few years as compared to September last year:

Year	Steam	Hydro	Year	Steam	Hydro
1922	8	92	1924	32	68
1923	6	94	1925 (Sept.)	88	12

In 1924 water was plentiful in the spring, but the fall was dry and this dry season continued through the next year. The Hale's Bar steam plant was rushed to completion early in the year, and this enabled the company to meet the recent shortage and to sell surplus energy to the Georgia Railway & Power Company. The large steam reserve on the system has been found necessary because there is very little storage at present available for the hydro stations.

A 66-kv. tie line with the Georgia Railway & Power Company at Cleveland has a capacity of about 10,000 kw., and a 110-kv. tie with the same company at Chattanooga has a capacity of 40,000 kw., which is at present limited to 15,000 kva. by the transformer bank installed. These two tie lines were utilized to sell energy to the Georgia Railway & Power Company during the season. A glance at the graphic chart showing conditions during September shows that energy was sold whenever it could be spared and that on Sunday especially steam power was utilized by the Georgia system so that water could be stored. At all times during the summer the Tennessee company rendered full service to its customers and utilized all possible generating capacity to help the Georgia system.

When asked about operations of the system, B. C. Edgar, vice-president and general manager of the Tennessee Electric Power Company, stated: "During the year we have utilized all our steam and hydro equipment and have been able to supply all our customers with service and to carry on our normal load building program. During peak load conditions we could not supply power to other systems, but were glad to sell power at off-peak periods to other companies. This power was sold at a slight profit and enabled us to get better and more economical generating conditions on the system.

"I believe in interconnection, but I believe each utility should build its system to supply service to its own customers under all contingencies that can be anticipated. The management of a utility is obligated to give service and to build its property with this idea in mind. State commissions and selfish interest will force each utility to take this stand in any emergency that may arise. Interconnection, however, permits each individual property to lower its reserve somewhat, to operate more economically, to use its station capacity more fully, especially if the properties build new stations on a systematic interconnected system basis, and to use hydro and steam stations on the properties to best advantage. For example, a hydro system with large storage facilities can fill its reservoirs in the wet season through using steam reserve and stream flow stations of the interconnected properties and thus equalize the proportion of steam and hydro capacity required on its own and neighboring properties during a dry period.

"For the purchase and sale of interconnected power we have a rate filed with the commission. This rate fixes the prices of hydro and steam power respectively and there is a coal clause adjustment on the steam power rate. Last summer the steam power sale price was about 1¼ cents per kilowatt-hour.

"In our experience interconnection has worked out very satisfactorily and I am a firm believer in its possibilities."

WHAT HAPPENED IN ALABAMA

The Alabama Power Company normally generates about 30 per cent of the energy from steam stations and 70 per cent from hydro stations. During September of last year 90 per cent of the energy was generated from steam plants because of the water shortage. The company utilized all possible equipment on its system and was able to render normal service and in addition to sell energy in large amounts to utilities in Georgia.

During the year the company operated 103,700 kva. in owned steam plants and 157,000 kva. in owned hydro plants. In addition it had 83,000 kva. in leased steam plants and 25,000 kva. in leased hydro plants. The peak load on the system reached 237,000 kva. at a load factor of 66.8. The maximum power supplied to other utilities during the peak period was 28,000 kw., but this was increased to 64,000 kw. during off-peak periods. A comparative picture of conditions on the property may be had from figures showing energy generated during the past few years during September:

Year	Steam	Hydro	Purchased
1923	40,277,000	28,091,000	465,000
1924	41,305,000	26,490,000	250,000
1925	94,924,010	9,935,660	9,655,231

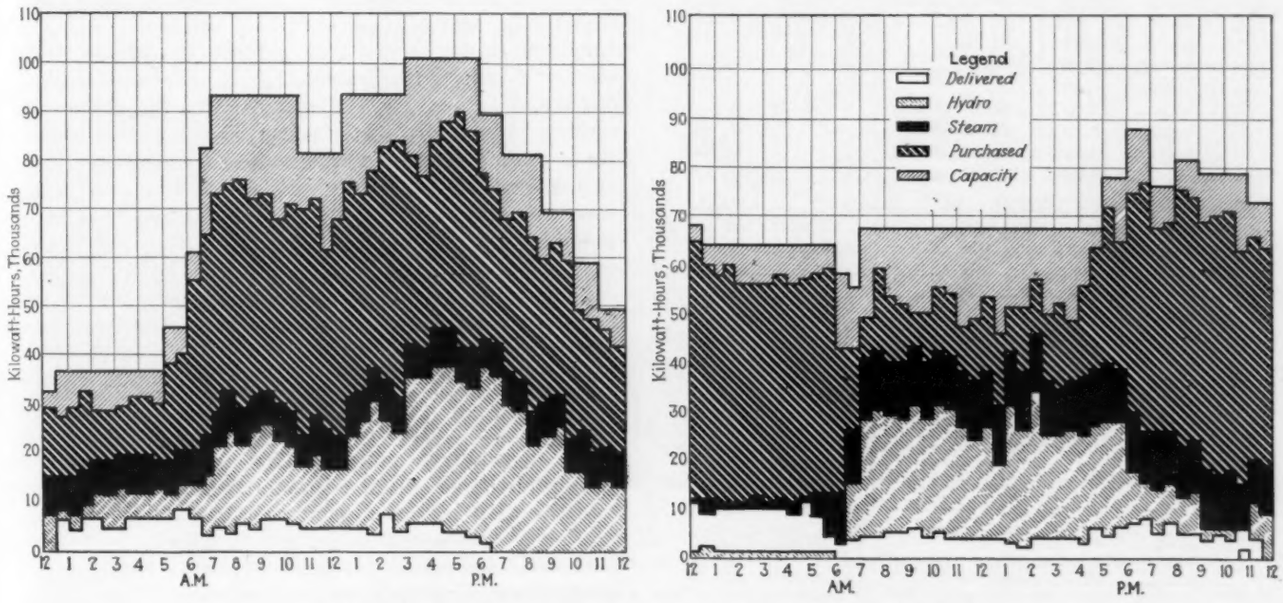
The system was not so unbalanced as the figures indicate if it is considered that every possible source of steam power was utilized in order to give aid to neighboring utilities. The property is in a large industrial area and many industrial steam plants were started and operated to give energy to neighboring systems which had primarily depended upon water power.

During last year large quantities of energy were sold to the Columbus Electric & Power Company and the Georgia Railway & Power Company. These companies used a large proportion of the energy and in addition acted as relay transmission companies to deliver energy generated in Alabama to utilities in eastern and southern Georgia.

of dump power profitably, and the combinations of steam and hydro plants found on the different systems make it possible to have a large regional power reserve for the use of any individual utility in the event an emergency occurs. From our own standpoint interconnection has worked out well and the result of the recent shortage is to confirm our building plans whereby we will increase our water storage facilities and will maintain adequate reserves in steam stations. Our Cherokee Bluffs development will be in operation in 1926 with 135,000 hp. in hydro capacity. This development also will give us one of the largest storage reservoirs in the world and make possible a splendid reserve on the system."

GEORGIA HARD HIT

A glance at the accompanying storage regulation chart shows very vividly the serious shortage in water experienced by the Georgia Railway & Power Company. At no time were the reservoirs more than 50 per cent



HOW LOADS WERE ADJUSTED IN GEORGIA TO CONSERVE WATER

(a) At left, normal load curve for Nov. 2, 1925. (b) At right, abnormal load curve for Oct. 8, 1925, during the period of shortage, when customers ran at night to give the highest possible load factor on the system.

The Alabama Power Company has a 110-kv. tie line with the Georgia Railway & Power Company at Lindale which has a capacity of 30,000 kw. and another 110-kv. tie with the Columbus Electric & Power Company at West Point with a capacity of 30,000 kw. Metering and synchronizing are done at 110 kv. and during the summer the capacity of each tie line was fully utilized at times.

In discussing the general subject of interconnection, E. A. Yates, vice-president and general manager of the Alabama Power Company, said: "Interconnection is profitable for utilities from the standpoint of revenue and service. If done properly, both the operating and the developmental programs of the utilities concerned will be co-ordinated very closely in order to take full advantage of system diversities, system characteristics and system plant-building programs.

"Each utility management should build to give service at all times to its customers, but interconnection makes such a program less expensive and more easily accomplished. In this region interconnection helps to dispose

full and reserves were not available at any time during the season.

The Georgia Railway & Power Company has unusually large storage reservoirs and depends very largely on water power to supply service. It has a storage capacity of 8,000,000,000 cu.ft. of water and a total generating capacity of 178,000 kw. in hydro plants. The steam station capacity on the system is 21,500 kw. In a normal year it fills its storage reservoirs during the spring and does not start to draw down until about the first of September. The normal rainfall in the watershed is 70 in. and during the first ten months of 1925 less than 40 in. of water fell, and in addition during the two previous years the rainfall averaged less than 65 in. Despite the fact that 1925 was entered upon with an excess of 12,000,000 kw.-hr. in storage over the calculated required values, no rain fell to amount to anything during the usually wet period and even the usual one or two July rains failed to occur; as a result storage water was used as early as April 1, and even in the middle of March the reserves were at

the minimum point. Thereafter the system was operated on reserves 50 per cent below the calculated safety margin indicated in the graph.

As a result the utility was forced to utilize all its own steam reserves and the steam plants of customers and to purchase energy from Alabama and Tennessee. By these means it was able to serve all customers during the water shortage, although the expense involved was large. A glance at the graph for September and of a typical daily generating chart shows the diversity of

GEORGIA RAILWAY AND POWER CO.

DAILY LOAD AND WATER REPORT

(Day) Tuesday

THIS REPORT SUBJECT TO CORRECTION DATA REPORT No. 15

(Date) 11/8/25

For 24 Hours Ending 12:00 M. N.

KWH GENERATED AT:		KWH DELIVERED TO:		KWH PURCHASED FROM	
Tall—Atl.	176,600	Col. Pwr. Co.	200 S	Scanlon Mill	1000 S
Tall—S. P. Co.	0	Central Ga.	0	Bibb Mfg Co.	12000 S
Tall—D. of D.	5,460	Tenn. Pwr. Co.	0	Lindale	0
Tall—Total	182,060	Sou. Pwr. Co.	0	So. Marble Co.	98,600 S
Tugalo	11 000	Ala. Pwr. Co.	0	Tenn. Pwr. Co.	267,400 S/H
Terrora	98,000	Aug. Aiken	17,000 S	Whitten Mill	9,000 S
Yonah	0			Sou. Pwr. Co.	0
Dunlap	35,100			Bibb Mill	13,800 S
Morgan Falls	196,400	Total	17,200	Ala. Pwr. Co.	243,000 S
Wofford Shls.	3,160			Aug. Aiken	60,000 S
Chestatee	7,900	Total KWH Generated		Gregg Shoals	0
Butler St.	0	Total KWH Generated and Purchased		Pocket Mills	21,900 S
Davis St.	172,180	Total Delivered Other Systems		Total	932,400
Total	648,460	Net KWH Used on G. R. & P. Co. System			648,460
					1,580,860
					17,200
					1,563,660

RESERVOIRS	EL. WHEN FULL KWH.		6 A.M. Tues. 11/5 Elev.	Mil KWH.	6 A.M. Elev.	Wed 11/4 Mil. KWH.
Burton	1866.0	85.8	1787.10	4.2	1788.30	4.5
Mathis	1689.6	22.4	1674.56	19.3	1654.20	19.1
Tallulah	1500.0	1.6	1497.20	1.5	1496.40	1.4
Yonah	744.25		735.40		738.90	
Tugalo	892.0	1.3	886.90	1.0	888.70	1.1
Morgan Falls	860.0	.0	869.80		859.60	
Dunlap	1015.0	.0	1015.30		1013.70	
Chestatee	1070.0	0	1069.60		1049.50	
Central Ga.	528.0		516.70		516.95	
Total		111.1		26.0		26.1

RIVER FLOW RECORD: 6 A. M. NEXT DAY. RAINFALL RECORD IN INCHES.

STATION	Sec. Ft.	Equiv. KW.	Equiv. KWH. 24 Hours	STATION	24 Hrs. Ends 6 P. M. 11/3	6 P. M. to 6 A. M. 11/4
Thru Burton Dam	0	0	0	Burton	.00	.00
Tiger Creek	40.	1600	38,400	Norcross	.00	.00
Chattooga River				H. P. Miller Chief Load Dispatcher		
Norcross	1,720	5,160	123,840	Via A. C. Mc		

TYPICAL DAILY LOAD AND WATER REPORT OF GEORGIA RAILWAY & POWER COMPANY DURING THE SHORTAGE

power-generating sources and sale outlets. It was a remarkable operating feat for the organization to accomplish under the strenuous conditions encountered. The principal tie lines of the company are:

1. A 110-kv., 30,000-kw. capacity tie with the Alabama Power Company at Lindale.
2. A 110-kv., 15,000-kw. capacity tie with the Columbus Electric Power Company at Newman.
3. A 110-kv., 40,000-kva. tie with the Tennessee Electric Power Company at Chattanooga. (Limited by transformers to 15,000 kw.)
4. A 66-kv., 12,000-kw. tie with the same company at Cleveland.
5. A 66-kv., 9,000-kw. tie with the Central Georgia Power Company in Atlanta.
6. Two 110-kv., 50,000-kw. capacity tie lines with the Southern Power Company at Tallulah Falls.
7. A 22-kv., 2,000-kw. capacity tie line with the Southern Public Utilities Company at Gregg Shoals.
8. A 110-kv., 10,000-kw. capacity tie with the Augusta-Aiken Railway Company at Augusta.

The tie lines with the Tennessee Electric Power Company, the Alabama Power Company and the Columbus Electric Power Company were often used at more than rated capacity during the summer. Also tie lines to the Central Georgia system and to the Augusta-Aiken Railway were used to relay power from Alabama to those properties.

The system peak load in September was about 75,000 kw., with a total hydro generation of 6,719,650 kw.-hr. and a steam generation of 7,957,232 kw.-hr., and 17,523,-111 kw.-hr. was purchased. The development of the water resources of the Tallulah and Tugalo rivers has gone on for about fifteen years and four of the developments have been completed. The Burton Dam and Nacoochee developments are nearing completion and when finished a total fall of 1,199 ft. will be utilized. Upon completion of these developments the storage capacity of the system will be about eight billion cubic feet with a generating capacity in hydro plant of 280,-000 hp.

EXECUTIVES FAVOR INTERCONNECTION

In an interview with President P. S. Arkwright he stated: "Interconnection has proved to be very beneficial to the electrical industry in the South. It guarantees better service and affords a regional reserve in times of emergency. Our system has great water storage facilities that can be relied upon under normal conditions to give reserve water power for other properties and to afford water power to our customers. In times of unprecedented water shortage, however, other systems with less storage capacity utilize their steam reserve capacity to supply our needs, and this makes possible economical and continuous service to our customers.

"Under the strenuous conditions experienced last year our most remarkable experience was in securing the co-operation of our customers. They have given us aid voluntarily and heartily through changing working hours from day to night, through starting up their own steam plants and through co-operating in every move made to conserve energy. This friendly co-operation enabled us to serve all customers during the shortage, and the only service discontinued was display lighting and some ornamental boulevard lighting."

General Operating Manager Frank L. Butler related some interesting operating experiences: "The normal rainfall in our watershed is about 70 in. Last year there occurred only about 22 in. up to July 1, so instead of reaching July 1 with 90,000,000 kw.-hr. storage we had about 45,000,000. On Sept. 1, when we should have had 50,000,000, we had 22,000,000. Needless to say, under these conditions every man on the system was alert to every opportunity to save water and to operate most efficiently all the stations and lines. The typical daily load and water report illustrated herewith gives some idea of the complexities of operation under the abnormal conditions encountered. Also a glance at our kilowatt-hour generating data during the month of September as compared with the past few years is interesting:

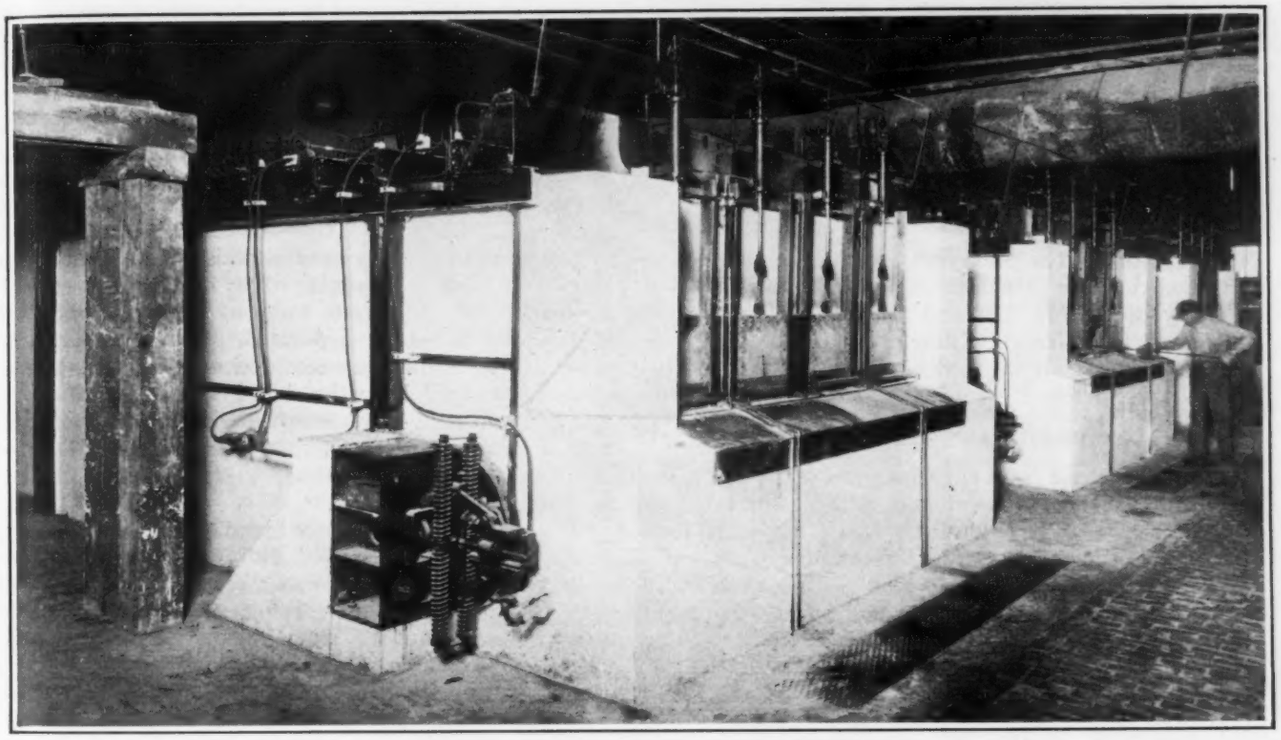
Year	1922	1923	1924	Month of September 1925
Hydro generation.	260,374,859	232,007,570	337,223,770	30,346,220
Steam generation.	9,449,440	4,446,295	8,833,804	972,400
Purchased	37,194,400	121,099,753	49,062,256	12,078,350
Relayed	.....	.....	.....	2,654,700

"It speaks well for the organization to find it met such an emergency so successfully."

The effect of the shortage in the Carolinas and a summary of the whole situation will appear in next week's issue.

Electrically Annealed Glass Superior

Illinois Pacific Glass Company in San Francisco Has Eight Electric Lehrs Turning Out a Product of High Grade and Remarkably Uniform Quality



BANK OF THREE ELECTRIC LEHRS IN THE PLANT OF THE ILLINOIS PACIFIC GLASS COMPANY AT SAN FRANCISCO

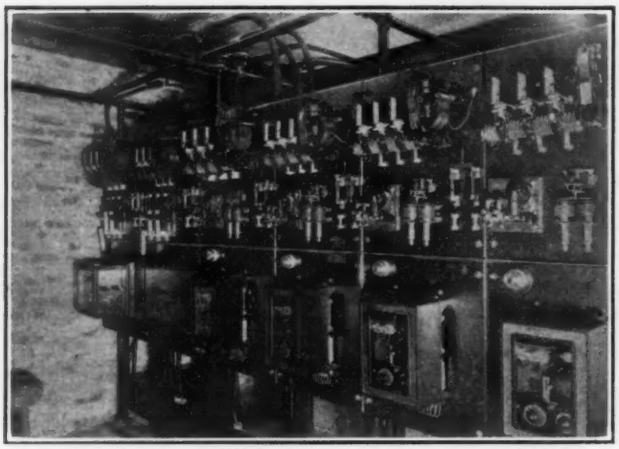
CLOSE temperature control and a higher grade of finished product are the principal factors that have influenced the Illinois Pacific Glass Company of San Francisco to apply electric heat to its glass-annealing lehrs. After five years of experimentation, part of which was in the laboratory, Kenneth M. Henry, chief chemist for the company, has perfected a scientific process for annealing glass and has successfully developed an electric lehr for annealing glass bottles. There are now eight of these in operation at the San Francisco plant, each of which has a connected load of 240 kw. and an average twenty-four-hour load of 80 kw.

The secret of the process is the uniform application of heat throughout the lehr and the close control of the time-temperature cycle made possible with electric heat under automatic control. Laboratory experiments had shown that deviation of more than 5 deg. F. from the scientifically correct time-temperature curve is not permissible if the glass is to be properly annealed and the quality of the product kept up to a high standard. Electricity has fully met these exacting requirements at no greater cost and besides offers the distinct advantages that the time required for the annealing process has been reduced and the product is sterilized as it comes from the lehrs.

A conveyor type of lehr 9x60 ft. has been found to be the most satisfactory to meet the conditions of the average bottle factory. The conveyor belt is made up of special patented pans, which cut off all stray currents of air. Four automatic doors to each lehr, which are operated by foot buttons, prevent loss of heat when glassware is not actually being placed into the oven. The heating units are of the standard industrial space heating type, under full automatic control, and will bring the lehrs up to a maximum temperature of 1,000 deg. F.

Arrangement of Lehrs

The lehrs are arranged in groups of three, each group being supplied by one glass furnace. Current for each bank of three lehrs is supplied from three 200-kva. transformers located in a vault directly below the lehrs. A 220-volt, three-phase, 60-cycle bus from these transformer banks leads to the control boards, also located in rooms below the lehrs. Each control room contains three separate control boards, one for each of the lehrs. The control boards each contain six panels on which are located the contactors and temperature relays for controlling the heating elements in the lehrs. Individual meters have been placed on each panel controlling a group of elements to ascertain the power consumption over a given period of time. From a heat balance the thermal efficiency of these lehrs has been shown to be 50 per cent greater than the efficiency of oil-fired or gas-fired furnaces. "Cellite," made by the Cellite Products Company, was used for



FRONT VIEW OF ONE OF THE HEAT CONTROL BOARDS

heat insulation. The conveyors and all steel work were furnished by the Stephens-Adamson Manufacturing Company of Aurora, Ill., and the heating units were supplied by the General Electric Company. Temperature relays used on the control boards were supplied by Leeds & Northrup Company.

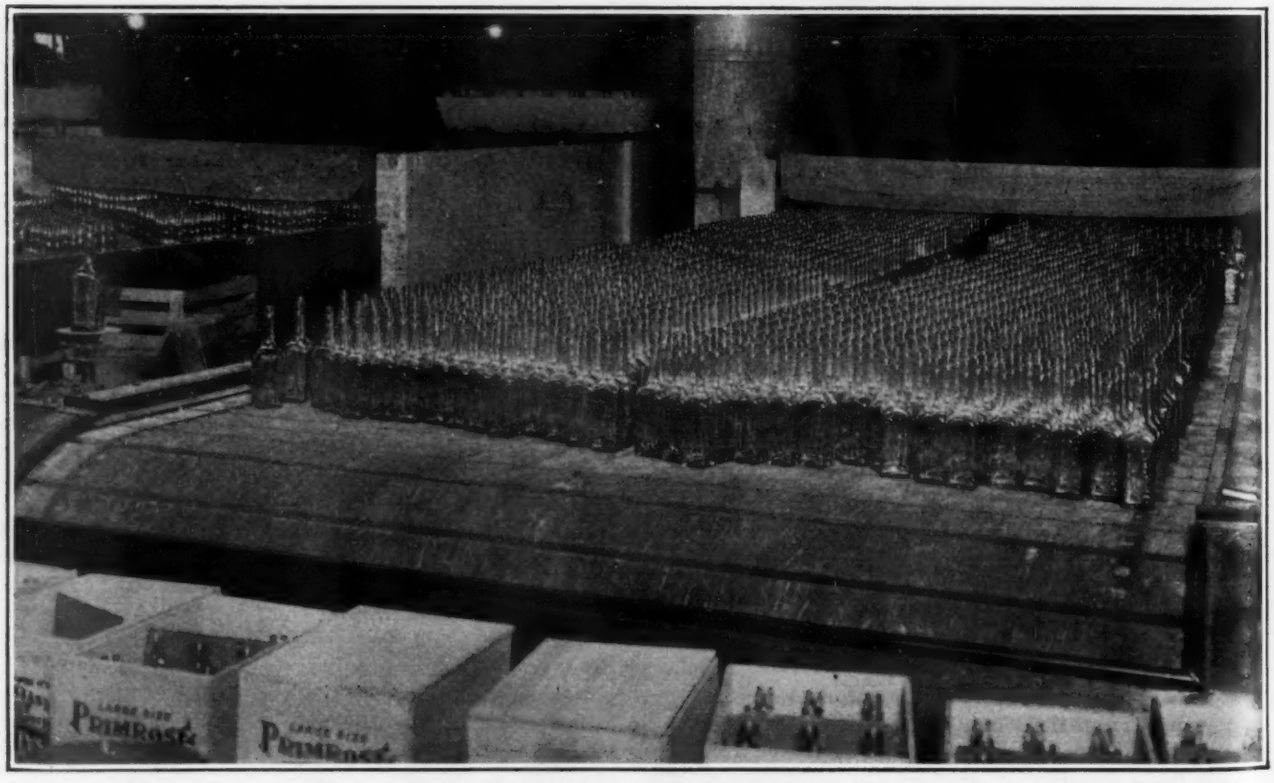
MAINTENANCE AND OPERATING COSTS

Maintenance has been surprisingly low, the first experimental lehr having cost only $25 during the four years it has been in operation. The other lehrs have been in operation for varying periods up to four years and so far there has been no maintenance expense on them. The average consumption for each lehr is about 1,900 kw.-hr. per twenty-four-hour day. The monthly load factor on the entire plant is upward of 90 per cent, enabling the company to earn an average rate of approximately 8 mills a kilowatt-hour.

On a recent three-day check run on electric lehr No. 4, annealing export beers of 11½ oz. capacity and 13½ oz. weight, it handled 931 gross, which was about three-fourths the capacity of the lehr, and consumed 7.09 kw.-hr. per gross, making the total annealing cost $5.67 per hundred gross. During the same three days electric lehr No. 5, running champagne-shaped minerals of 6¾ oz. capacity and 10 oz. weight, handled 1,048 gross, which was also about three-fourths the capacity of the lehr, and consumed 6.51 kw.-hr. per gross, making the annealing cost $5.21 per hundred gross. These cases are considered typical and represent a saving in annealing cost of about 20 per cent over the former fuel-fired lehrs in this particular plant. However, by far the greatest advantage of the electric lehr lies in the vastly improved quality of the product through uniformly and constantly perfect annealing, impossible of accomplishment by any other method heretofore employed.

The demand for the very superior ware from these lehrs has been so insistent that it has been embarrassing to the company to complete the change of lehrs as leisurely as had been planned. In fact, it has been compelled to install the electric lehrs and put them into operation as rapidly as the shut-down of glass furnaces would permit. A ninth electric lehr is now being installed and in a short time the entire output of the Illinois Pacific Glass Company will be annealed in electric lehrs.

The company has recently installed two electric lehrs having a connected load of 470 kw. at its Alton, Ill., plant for annealing 5-gal. water bottles. The large size of these bottles and their resulting comparative thinness of wall make the annealing of such ware to be regarded by glass manufacturers as one of the most difficult processes in the industry and it is gratifying to note that results here have been entirely satisfactory.



COLD END OF A HENRY ELECTRIC LEHR

Dr. Georg Klingenberg Dies

Greatest German Authority on Power Production and Fuel Utilization—Internationally Famous as Central-Station Designer—Had Just Finished Design of the 240,000-Kw. Rummelsburg Station in Berlin

DR. GEORG KLINGENBERG died in Berlin on Dec. 9, 1925, after a brief illness. This news has been received with sorrow by engineers in all parts of the world, because Dr. Klingenberg as a man and an engineer was an outstanding figure in economic and engineering affairs.

He was an indefatigable student of power production and utilization and a great authority on station design and operation. His studies on the possibilities of coal distillation, the use of low-grade fuels and other conservation projects form only a small part of his contributions to engineering. He was one of the international authorities when the great Victoria Falls development in Africa, involving a Cape-to-Cairo transmission system, was seriously considered. He was a counselor of the German government in the formulation of plans for greater and more economical power production and for major interconnections in Germany and was consulted in connection with large power projects by clients in other parts of the world. He was one of the big international engineers of his day.

GEORG KLINGENBERG

Dr. Klingenberg was born on Nov. 28, 1870, and was graduated from the gymnasium at Osnaburg. He then went to the Technical High School at Charlottenburg and at the age of 23 became a teacher in this school. Here he devoted his energies to engineering and became a teacher of central-station design. His outside work started with the construction of the plant at Holstein. This station was so successful that he was called upon to design other stations at Rostock, Schwerin, Charlottenburg, Halle and Potsdam. He combined thorough technical knowledge, practical experience and originality to a marked degree in his teaching and in his professional work and became a recognized authority on station engineering at the age of 32.

And then came the big step in his career. Walter Rathenau temporarily left the A.E.G. in 1902, and the executives of this great company immediately turned their eyes to the 32-year-old high-school professor at Charlottenburg. They secured the services of Dr. Klingenberg and found they had engaged a man with new conceptions of the possibilities in the power field and one having the ability to carry these conceptions to successful conclusions. He designed many improvements in coal-handling systems for power plants and then turned his attention to the boiler and its accessories. In his opinion, the burning of fuel economically called for unity in treatment of boiler, economizer and stack and the use of a higher pressure and temperature for the steam. He applied these ideas to actual installations and then turned his attention to the realization of stations designed as an economical unit assembly. This led him to a study of load factors and thence into the transmission field. Then came the war and he was called upon to study the possibilities of by-product distillation, nitrogen production and the use of low-grade fuels. His reports on these subjects were thorough and authoritative and are printed in his recently revised book on power stations and elsewhere.

Outstanding stations designed by Dr. Klingenberg include the Victoria Falls Paper Company plant at Riesen, in South Africa; the 180,000-kva. Golpa steam plant in Germany, which was completed during the war in ten months' time, and the new steam-power plant of the city of Berlin at Lake Rummelsburg, which, when completed, will be rated at 240,000 kw. These stations are economical, splendidly designed, embody many new features and have been carefully studied by engineers in all countries.

The reputation of Dr. Klingenberg was international and his writings were greatly valued. One of the last articles he wrote was for the September 21, 1925, issue of the ELECTRICAL WORLD. In Germany he was the greatest authority in his field and a past-president of the Verein Deutscher Ingenieure and the Deutsche Verband Technisch-Wissenschaftlicher Vereine. He was also a director of the Allgemeine Elektricitäts-Gesellschaft.

Many engineers look upon Dr. Klingenberg as the man who had the greatest influence upon the great developments in station design. He approached a design project from an economic standpoint and demanded equipment that would yield the most economical results. In this way he early visualized and used economizers, high steam pressures, large units and economical heat balance systems.

Generation and Distribution by the Central Electric Light and Power Companies in the Various Nations of the World

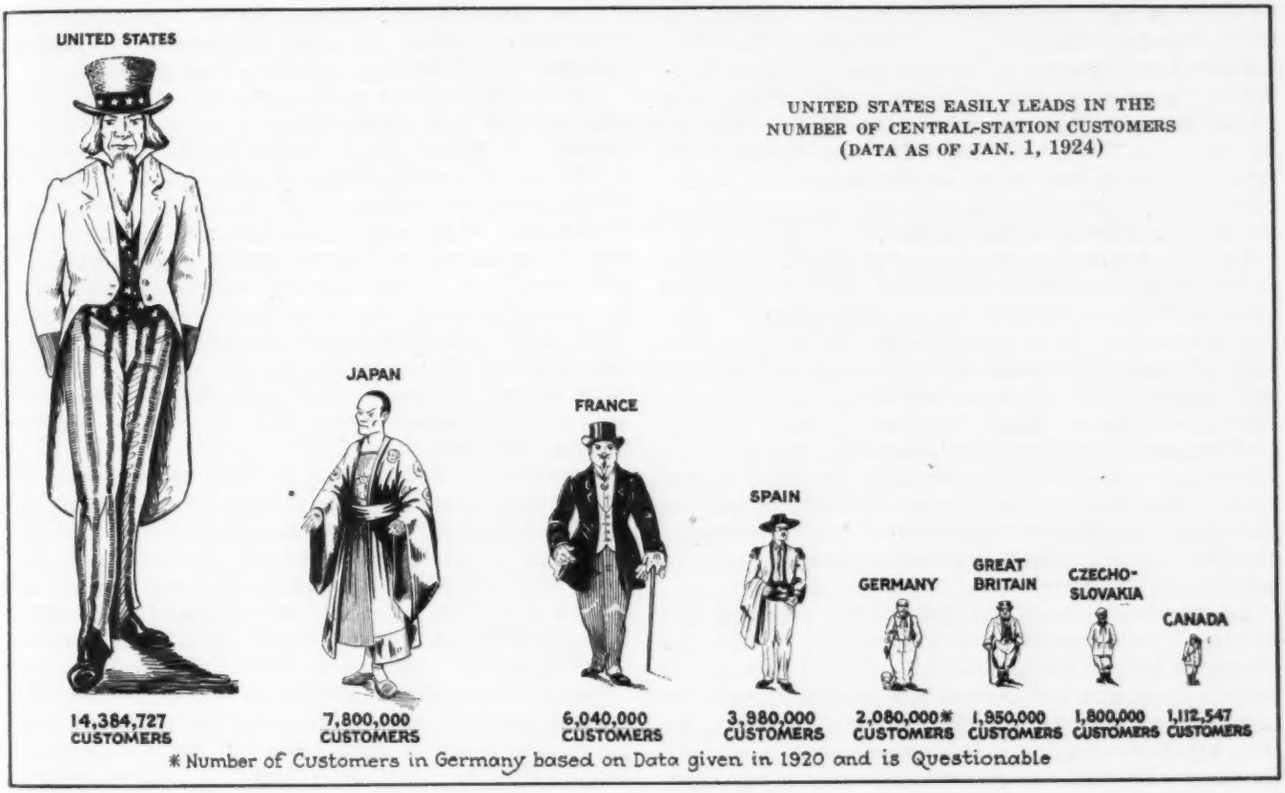
(Data obtained through the co-operation of the United States embassies in each country)

Country	Population Jan. 1, 1924	People Living in Electric Lighted Abodes Jan. 1, 1924 Number	Central-Station Customers of All Kinds Jan. 1, 1924	Number of Central-Station Operating Companies Jan. 1, 1924	Number of Central Generating Plants Jan. 1, 1924	Total Generator Rating: Fuel-burning Plants Jan. 1, 1924 Kva.	Total Generator Rating: Hydro Plants Jan. 1, 1924 Kva.	Generation and Distribution of Energy—1924: Energy Used for Lighting Kw.-Hr.	Energy Used for Power Kw.-Hr.	Energy Used for Railways Kw.-Hr.	Energy Lost in Transmission Kw.-Hr.	Total Energy Generated Kw.-Hr.	Water Power (E): Potential (Minimum) (F) Hp.	Water Power (E): Developed Hp. (Includes Private Plants)
North & Central America														
United States	112,684 000	(a) 57 600,000	14,377,431	(a) 6,355	(a) 5,444	15,866,000	7,281,700	12,600,000,000	25,092,873,000	6,200,530,000	10,520,000,000	54,413,423,000	34,818,000	10,037,655
Canada (J)	9,226,740	(K) 3, 960,000	1,112,547	848	532	223,677	1,760,000					8,099,192,000	18,250,000	3,227,000
Newfoundland	261,000	50,000	1,100	3		7,850						7,000,000	400,000	60,000
Mexico	16,767,000	350,000		108		(L) 305,809	(D)					300,000,000	6,000,000	300,000
Cuba	2,889,000	545,000	136,000	87		166,000		54,468,000	31,762,000	57,433,000	35,731,000	179,394,000		
Haiti	250,000	7,000	2,500	1	2	800	0	1,080,000	3,600,000	0	84,000	4,764,000		
Dominican Republic	895,000	60,000	16,000	8	(b) 16	(c) 23,300	0	(c) 5,500,000	(c) 50,000,000	0	(c) 15,000	(c) 55,500,000		
Salvador	1,500,000	100,000	25,000	10	10			8,700,000	7,300,000				200,000	2,700
Costa Rica	500,000	45,000	19,000	20	24	300	10,556	(d) 5,400	(d) 3,528	(d) 300	(d) 1,628	(d) 10,856	1,000,000	15,000
South America														
Uruguay	3,000,000			8		(L) (r) 34,198	(D)					81,300,000	300,000	0
Peru	4,500,000	450,000	150,000	11	15	(L) (r) 40,299	(D)					96,200,000	4,500,000	55,000
Venezula	3,000,000			38		5,050	7,530					30,000,000	3,000,000	12,500
Colombia	5,475,000			13		(L) (r) 7,279	(D)					17,000,000	4,000,000	25,000
Guianas	437,000			3		(L) (r) 1,840	(D)					4,500,000	3,800,000	0
Brazil	30,491,000	2,000,000	250,000	46		(L) (r) 242,777	(D)					580,000,000	25,000,000	450,000
Argentina and Paraguay	6,900,000			205		(L) (r) 624,943	(D)					1,220,000,000	7,000,000	25,200
Bolivia	3,000,000			10		(L) (r) 14,366	(D)					34,000,000	5,000,000	25,000
Chile	4,000,000			48	(e) 18	(e) 98,055	(e) 89,749	(e) 43,000,000	(e) 552,000,000	(e) 27,000,000	(e) 55,000,000	(e) 677,000,000	2,500,000	90,000
Equador	1,300,000			24		(L) (r) 6,295	(D)					15,000,000	1,000,000	5,500
Europe														
Greece	6,000,000	1,600,000	40,000	34	60	17,950	230	11,881,000	5,156,000	10,266,000	9,155,000	36,458,000	250,000	8,000
Bulgaria	4,958,000	300,000	60,000	7	7	24,400						48,700,000	1,200,000	8,000
Denmark	3,352,000	2,500,000	583,982	509	471	131,000	(D)	65,015,000	96,932,000		31,642,000	193,589,000	9,000	1,500
Great Britain	46,000,000	8,000,000	1,950,000			4,530,000	(D)					6,681,524,000	850,000	250,000
Sweden	6,005,709	2,500,000	500,000	421	773	1,600,000	(D)	(g) 289,028,000	(f) 1,970,718,000	71,186,000	359,875,000	2,348,615,000	8,000,000	1,416,000
Latvia	1,900,000	450,000	105,000	45	45	15,200	(D)	9,000,000	7,500,000	4,750,000		22,300,000	(G) 100,000	(G) 5,000
Jugoslavia (B)		205,200	39,550	3	3	23,250	2,400	20,176,636	10,428,000	4,988,555	(C)	35,593,191	2,200,000	166,000
Poland	29,000,000	3,915,076	209,183	111	258	(L) 146,000	(D)	(h) 182,696,576	(i)	(i)	32,515,249	215,211,825	1,400,000	85,000
Belgium	7,666,055	2,600,000	492,000	510	793	1,012,000	500	500,000,000	1,070,000,000	93,000,000		1,663,000,000	Small	700
Hungary	8,158,590				148		2,200	80,500,000	94,500,000	105,000,000	70,000,000	350,000,000	175,000	3,000
Czechoslovakia	15,500,000	8,000,000	1,800,000	384	(j) 396	265,779	21,943	34,400,000	265,000,000	(K) 40,600,000	80,000,000	420,000,000	1,000,000	155,000
Spain	21,338,381	17,100,000	3,980,000		2,400	(L) 900,000	(D)						4,000,000	1,000,000
Switzerland	3,900,000	3,600,000	940,700	1,342	330	(r) 58,040	(r) 777,160	160,000,000	(s) 775,000,000	(t) 340,000,000	103,919,000	(u) 1,970,000,000	2,500,000	1,490,000
Netherlands	7,212,735	2,280,000	552,235	16	89		0	192,291,236	252,841,655	39,283,479		484,416,370	Small	150
Norway	2,731,619	1,800,000	420,000		2,534	(m)	(l) 1,453,810	(n) 179,336	(n) (o) 1,026,469	(p)	(n) (q) 307,201	(n) 1,513,006	9,500,000	1,820,000
Rumania (w)	17,500,000	60,000	13,800			20,400		12,000,000	(v) 12,000,000	6,000,000	3,600,000	33,600,000	1,100,000	30,000
France	40,000,000	26,000,000	6,040,000	(x) 100		1,800,000	1,000,000					6,000,000,000	5,400,000	2,100,000
Esthonia	1,107,059	250,000	25,000	200	40	10,300	4,600	8,000,000	20,000,000	300,000	4,700,000	33,000,000	125,000	16,950
Turkey	10,000,000	200,000	30,230	1	1	36,000	0	11,550,000	8,320,000	7,830,000	5,350,000	53,050,000	Small	0
Lithuania (Y)	(A) 2,175,121	94,000	6,606	1	2	2,200	0	2,188,000	1,133,000	0	1,389,000	4,710,000	(H)	(H)
Finland	3,330,000	300,000	90,000			12,500	138,000	55,000,000	60,000,000			115,000,000	1,800,000	220,000
Italy	40,000,000	4,800,000	1,070,000			820,000	1,950,000	471,000,000	4,929,000,000	(I)	(J)	5,400,000,000	3 800,000	1,800,000
Germany	60,900,000	9,000,000	2,080,000		3,478								2,000,000	1,100,000
Portugal	6,000,000	400,000	100,000										300,000	10,000
Asia														
Japan	77,000,000	41,300,000	7,800,000	780	4,500	(r) 720,000	(r) 1,095,000					8,000,000,000	4,500,000	1,694,000
Africa														
Liberia	2,000,000	200	45	1	1	40	0						4,000,000	0
Oceania														
Australia	5,497,000	1,978,805	526,536		247	(L) (r) 558,948	(D)	177,448,986				1,307,948,236	600,000	200
New Zealand	1,219,000	824,030	124,705		57	(L) (r) 65,954	(D)	18,000,000				173,993,293	2,500,000	45,000

a—United States Census of Central Stations Jan. 1, 1923. b—Includes sixteen generating plants on sugar estates. c—Includes energy generated in sixteen plants on sugar estates. d—Average load in Kva. e—Figures cover operations of companies in Los Andes, Talca, Copiapó, Punta Arenas, Valdivia Osorno, Valparaiso, Chuquicamata and Sewell only. f—Includes 1,252,389,000 kw.-hr. used for power in large industries, in heating and in lighting these factories; 461,818,000 kw.-hr. used by electrochemical and electrothermic industries and 256,511,000 kw.-hr. used in developing steam power. g—Includes 36,000,000 kw.-hr. used for illumination and household apparatus on farms and 27,000,000 kw.-hr. for agricultural motors. h—Includes energy used for power purposes and sold to electric railways. i—Included under "lighting." j—Does not include 1,200 private industrial electric generating plants. k—The amount used by railways is increasing rapidly. l—A small part of this figure is in steam-electric plants. m—Included under "hydroelectric." n—Connected load in kilowatts. o—Consumed by electric motors, 490,976,000 kw., used by electrochemical industry, 535,493 kw. p—Included under "power." q—Used for other purposes (cooking, warming, etc.). r—Kilowatts. s—Total connected load, including lighting and power estimated at 1,455,400 kw. t—Energy exported. u—Energy produced in private electric generating plants during 1924, estimated as follows: 150,000,000 kw.-hr. by electric railways, 650,000,000 kw.-hr. by electrochemical and electrometallurgical industries and 200,000,000 kw.-hr. by other miscellaneous industries; the total amount of energy generated in Switzerland during 1924, including central-station and private-plant generation, is estimated at 2,970,000,000 kw.-hr. v—Includes 4,500,000 kw.-hr. used in waterworks. w—Includes only companies operating in Bucharest; operations outside Bucharest are unimportant. x—Plants of 10,000 kw. or over. y—Includes only companies operating in Kovno. A—Population of Kovno is 94,000. B—Includes only companies operating in the cities of Belgrade, Zagreb, Ljubljana and Karlovac. C—Included under other items. D—Included under "fuel-burning plants." E—Data compiled by United States Geological Survey. F—Waterpower available 90 per cent of the time at 70 per cent efficiency. G—Includes Lithuania. H—Included under Latvia. I—Included under power. J—Data as of Jan. 1, 1924, or for year 1923. K—Estimated. L—Includes hydro plants.

World Status of Central-Station Industry

United States Easily Leads in the Total Production of Energy by Central Stations, but Canada Leads in Production per Capita—Large Proportional Consumption by Electric Railways in Most Countries



THE high plane which statistical research has attained in the United States is clearly indicated when an attempt is made to obtain comprehensive statistics on the operations of industry in foreign countries. In this country statistics on individual operations are available in great detail for almost every industry of any importance. Business and market trends are easily followed, and the all-important developments of the future are possible of fairly accurate prediction.

The effort to ascertain the present status of the electric light and power industry in the various foreign countries of the world has brought out the small amount of accurate information available on the operations of the industry in these countries. The information was requested through the various American embassies with the thought that the data, if they were obtainable at all, would be furnished if requested by the American government officials. But in only a few countries was the complete information available, and in many cases where data were given on the operations of the industry the figures were largely an estimate, if not a pure guess. Some of the more important countries did not respond at all to the request for information. The tabulation of the operations of the electric light and power industry (page 98) is therefore incomplete, but it presents the best information that is available on the subject at this time.

The United States easily leads in the total amount of energy generated by electric light and power companies, with 54,413,403,000 kw.-hr. in 1924, followed by Canada with 8,099,192,000 kw.-hr. and Japan with 8,000,000,000 kw.-hr. It is possible that Japan's production exceeded that of Canada during 1924 as the information obtained from Japan was not complete. The "mother countries" of Europe are forced to the rear in the total operations of the central-station industry. No report was obtainable on Germany, but Great Britain seems to lead the nations of Europe with 6,681,524,000 kw.-hr., followed by France with 6,000,000,000 kw.-hr. and Italy with 5,400,000,000 kw.-hr. There is no doubt, however, that in the total amount of energy generated by both public utility and private plants Germany easily leads all other nations in Europe.

Quite a different picture of central-station operations is presented when the amount of energy generated per capita is considered. The central-station industry in Canada easily leads in generation per capita with 878 kw.-hr., followed by Switzerland with 505 kw.-hr. and the United States with 484 kw.-hr. But this does not at all mean that the consumption of electrical energy in Canada and Switzerland is greater than or as great as in the average home in the United States. Canada exports about a billion and a quarter kilowatt-hours per annum, and she also has some industries, such as the paper industry, which use a very large amount of

electrical energy. Switzerland exports a total of 340,000,000 kw.-hr. out of a total of 1,970,000,000 kw.-hr. Both of these facts must be taken into consideration when comparing the energy generated and the consumption per capita.

Several of the nations were unable to segregate their energy consumption as between light, power and railways. A study of the table on page 98, however, gives a fairly good picture of the part which lighting and power play in the operations of the central-station industry in this and foreign countries. Nations like Chile, Sweden, Czechoslovakia, Switzerland and Italy use only a small percentage of their electrical energy for lighting purposes, whereas in the United States only about twice as much energy is used for power as for lighting. In Czechoslovakia, Cuba and Hungary the reports indicate that more energy is used for transportation purposes—electric railways—than in lighting the cities and homes of the nation.

The data reported on the number of inhabitants living in electrically lighted dwellings are, of course, a pure estimate, but are included in the tabulation for what they are worth. It is inconceivable, for instance, that 92.3 per cent of the people of Switzerland and 80.2 per cent of the people of Spain are living in electrically lighted dwellings. Japan without question has the highest percentage of the population living in electrically lighted abodes, but the information received in the survey would indicate that several other nations are far more highly electrified than Japan. The information on this item is without question open to possible correction.

Information is also included on the potential and developed water powers of the various nations as estimated by the United States Geological Survey. It would appear that Switzerland has developed her water powers to a greater extent than any other country, the little republic reporting a development of 59.5 per cent. Germany and Italy also report a high degree of water-power development, with 55.0 per cent and 47.3 per cent respectively.

Letters from Our Readers

A Woman Speaks About Trees

To the Editor of the ELECTRICAL WORLD:

I cannot resist commenting, from the viewpoint of a club worker, on the articles on trees in the Nov. 7 and Dec. 5 issues of the ELECTRICAL WORLD. Although one of the laity, I do not subscribe for any periodical that appeals more to my interest than the ELECTRICAL WORLD, and, having read your editorial and Mr. Smith's comment, I wish to say that there is a movement under way among club women of the Federation who stand for culture, beauty and civic improvement to abolish the electrical menace to trees. You will concede women usually are "go-getters."

Electricity as well as the tree is God's universal gift to man. Each serves its purpose, and these purposes must not be allowed to conflict. Imagine a wonderful old sequoia at the mercy of an electric current! Simply criminal, and all trees are just as precious. The beautiful poem "Trees," by Joyce Kilmer, which was reprinted in Mr. Smith's letter, is published in song-record form and every music cabinet should have it. A knowledge of this poem should certainly turn the heart of a vandal into that of a lover of God and Nature. Continue the good fight to save the trees!

Abilene, Kan. GRACE Y. RUMBALL.

Superpower and Mutual Power

To the Editor of the ELECTRICAL WORLD:

The railroads, supplanting the stage coach and the canal, began as small lines, then interconnected and merged into great systems. But the automobile, the local and interstate bus and the motor truck have changed the former "last word" in transportation.

The central stations at which we once marveled were pigmies, but they have grown to form an army of giants. A single giant water turbine can develop 30,000 hp. or more and take 94 per cent of the useful energy from the falling water in so doing, but about 80 per cent of the cost of the power to the consumer may lie in getting that power to him after it has been generated. As in the days of railroad development, the central stations are interconnecting and merging. Little hydro plants that could not exist alone feed into the network. The Carolinas are bound fast by a network of power, any section being able to pass to an adjacent section power that may be required and receiving assistance in kind.

According to statistics as of 1924, published in the ELECTRICAL WORLD, private electric generating plants furnished 39.1 per cent of the 28,400,000,000 kw.-hr. consumed by all industries of the United States, the remaining 60.9 per cent being purchased from central-station companies. In an editorial in the Dec. 26 issue of the ELECTRICAL WORLD the question is asked, "Should Central-Station Companies Buy Surplus Industrial Power?" This article referred to industries which require a great deal of process steam and relatively little power, and it quoted Joseph Pope of Stone & Webster, Inc., as pointing out at the recent fuel and power meeting of the Affiliated Technical Societies of Boston that this is undoubtedly the Utopia of conservation, but that there are many real obstacles to be overcome before it can be reached.

In dealing with individual industrial plants, such a plan would seemingly operate like carrying coals to Newcastle. It is the writer's opinion that the conservation of heat in industrial plants is the duty of the industrial engineer and plant engineering staff, but that the central-station companies can successfully purchase surplus power from groups of manufacturers.

Suppose the manufacturers in suitable districts should interconnect to form groups that would feed surplus power into the central-station companies' feeders—one group per feeder and metering equipment—with both of the latter under the absolute control of the central-station company. Such an arrangement also would result in mutual economies and continuity of service to the manufacturers generating their own power. With meters running forward or backward, according to whether a member of the group was helping others or being helped, settlements for energy supplied or received during a month or a year would be of a mutual nature and could be handled like bank clearings. Surely this has possibilities, since the metering and other problems to be solved by the central-station companies would be reduced in proportion to the number of plants interconnected to form a group. CHARLES R. UNDERHILL.

Waterbury, Conn.

Central Station and Industrial Practice

Overhauling Turbo-Generators

ALTHOUGH the Conners Creek station of the Detroit Edison Company is only ten years old, every turbo-generator in it will have to be entirely overhauled and rebuilt before another year goes by, according to E. B. Rall of the production department. This is not peculiar to this station or company, but is required for safety and efficiency. Six units are installed, three rated at 20,000 kw., two at 45,000 kw. and one at 30,000 kw.

Overhauling produces a very marked increase in efficiency of these units, by removing the causes of depreciation in economy that develop after a unit has been in operation some time. Based on an average load, a net saving of approximately 192,000 lb. of steam per day results. Assuming that a unit runs 300 days a year, a net saving of 3,600 tons of coal per year is thereby effected.

When a comparison of steam rates with those obtained when a unit is new indicates that there is internal trouble, the casing is removed and a check is made of wheel clearance, wheel blading, diaphragms, shaft-sleeve packing and steam nozzles. The generator field and armature coils are inspected at the same time.

As a result of inspection the wheels of four units have been sent back to the manufacturer for rebuilding. Those of the remaining two units will receive similar treatment in order after the unit now dismantled is back in service. Inspection of the 30,000-kw. unit now dismantled showed badly worn wheel blading, diaphragms and shaft sleeve packing, loose field wedges and blocks, reduced coil ventilation and puffed ends on armature coils. New diaphragm and sleeve packing will be installed. Blades requiring it will be straightened and cleaned. Each wheel will be tested for vibration in order to determine its critical speed.

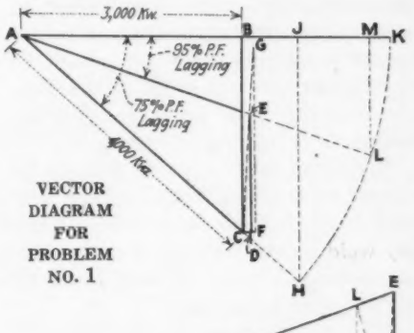
A new operating governor not so sensitive as the old one will be installed, and a new emergency governor of the oil-ring type will be added for tripping the throttle in case of overspeed. A new thrust bearing of the Kingsbury type will be also installed, and the wearing plates in the coupling between the turbine and generator shafts will be renewed.

While this work is being done the field and armature of the generator will be fitted with new sets of coils to increase reliability and enable adapting the unit to 80 per cent power factor instead of 90 per cent with the same rating. To supplant washed cooling air from outdoors, surface air coolers supplied with water from the condenser circulating pump discharge are being installed. By so doing the company expects to avoid shutting down the generators for cleaning so often as formerly.

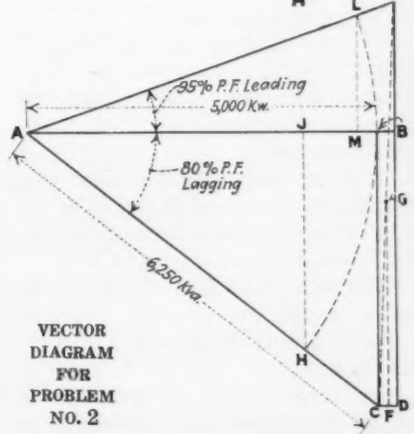
Determination of Synchronous Condenser Capacities

BY V. P. BRODSKY

THE determination of the capacity of a synchronous condenser required to improve the power factor of a line is usually made by means of curves obtained empirically, or calculated and computed. Both methods are often checked by means of trigonometrical calculations or graphical solutions.



VECTOR DIAGRAM FOR PROBLEM NO. 1



VECTOR DIAGRAM FOR PROBLEM NO. 2

Curves obtained by computation are not always at the disposal of the engineer, and they generally require interpolation. Empirical curves are often incorrect and require a thorough check by means of graphical solutions, which makes the method long and tedious.

The purpose of the following is to present a method for solving these problems which is sufficiently accurate for practical purposes. This method requires a table of kilowatt losses for different sizes of synchronous condensers. The knowledge of percentage ratio of kilowatt loss to kilovolt-ampere capacity for certain limits of sizes of synchronous condensers is, however, quite sufficient for this purpose.

This method is based on the assumption that for the purpose of approximate determination of condenser capacities by vector diagrams the difference in numerical values between the actual reactive kilovolt-amperage of the condenser and its total kilovolt-amperage can be neglected. This assumption can be made, because the angle between the two values is very close to zero. The method is illustrated by the solution of the following problems:

Problem 1. Required to improve the power factor of a circuit of 4,000 kva. 75 per cent power-factor lagging, to approximately 95 per cent lagging by adding a synchronous condenser in parallel with the load.

Solution. Draw to scale $AB = 3{,}000$ kw. and $AC = 4{,}000$ kva. at 75 per cent power factor lagging. Draw line AL corresponding to 95 per cent power factor lagging. For synchronous condensers of 1,000 to 4,000 kva. the kilowatt losses are approximately 5 per cent. Therefore, from point C draw line CF at an arbitrary scale and line $FG = 20 \times CF$. The intersection of CG and AL gives CE, capacity of synchronous condenser required. $CE = 1{,}625$ kva. The nearest commercial size of synchronous condenser is 1,500 kva.

Problem 2. Required to improve the power factor of a circuit of 6,250 kva. 80 per cent power-factor lagging to ap-

proximately 95 per cent leading by adding a synchronous condenser in parallel with the load.

Solution. Draw to scale $AB = 5{,}000$ kw. and $AC = 6{,}250$ kva. at 80 per cent power factor lagging. Draw line AL corresponding to 95 per cent power factor leading. For synchronous condensers of 5,000 to 10,000 kva. the kilowatt losses are approximately 4.5 per cent. From point C draw line CF at an arbitrary scale and line $FG = 22.2\ CF$. The intersection of CE and AL gives $CG = 5{,}625$. The nearest commercial size of synchronous condenser is 5,000 kva., therefore the corrected power factor is 98 per cent leading.

Radio Interference Reports Anticipated

Street-Lighting Systems Checked by Station Operator to Determine Circuit Giving Trouble

THE location of a radio interference in the arcing filament terminals of a street lamp was the inspiration of a novel idea for dealing with this type of interference by the Municipal Gas Company of Albany, N. Y. According to A. Anderson, of that company, who reported the matter at the annual meeting of the electric section of the Empire State Gas and Electric Association, the idea is applied as shown in the following:

One terminal of the double lead from a 1,500-ohm telephone receiver is connected to a piece of No. 8 wire 6 or 7 in. long and the whole heavily taped. The other lead terminal, well insulated from the first, is brought out from the outer tape layers in a piece of thin flat metal. To inspect a circuit the station operator holds the receiver to his ear and with his other hand brings the tape-covered electrode near the pilot lamp on the panel of the constant current transformer feeding the circuit under inspection. The thumb of the hand holding the electrode is pressed down on the metal strip issuing from the layers of tape.

The three usual circuit conditions—normal operation, burned-out lamp and arcing—manifest themselves by characteristic tones in the hum of the receiver. After experiment to identify each sound with its circuit condition, the operator can very easily and rapidly make periodic inspections of the circuits from his station, and when he finds an abnormal condition, can often get the outside trouble man started in the right direction long before the radio listeners begin to scream that some one is trying to play a solo on a dental drill.

Instructions for Welding Pipe Lines

IN A PAPER presented recently before the American Welding Society in Boston by A. W. Moulder of the Grinnell Company, Inc., on gas welding of power plant piping definite specifications as to methods and instructions were given. Mr. Moulder said that the proper materials, properly prepared, and essential tools and accessories must be selected by the engineering departments of the various companies and welders must be instructed in following such methods to the last detail. Although there may be several excellent ways to do the same thing, the Grinnell Company has found it best to choose one way and stick to it—so that constant practice may make perfect. As an example he gave the company's method of making a plain butt weld, which follows:

"Ends to be brought to within $\frac{1}{16}$ in. of closed, then tack them together at two or more points. Commence the weld at a third point and continue to weld around the whole circumference from the starting point. It is important that when the welder comes to the point where he has tacked the two ends of the pipe together this fillet be thoroughly remelted in tying into the new weld.

"Bring ends of pipe at bottom of groove to welding heat, puddle and weld ends of pipe before depositing any welding rod and bring both sides of groove to a welding heat as filling of the joint progresses.

"Fill the joint so the thickness of metal shall be one-third times greater than the thickness of the pipe—for instance, pipe $\frac{3}{8}$ in. thick, joint $\frac{1}{2}$ in. thick.

"It is of extreme importance that in finishing the final tie-in weld the weld already made be heated back on both sides a distance of 2 or 3 in.

"The joint shall extend beyond the edges of the groove—for example, width of groove $\frac{3}{4}$ in., width of joint 1 in. to $1\frac{1}{4}$ in.

"On large sizes of pipe it is usually advisable and economical to work two welders, one on each side of the pipe.

"The sections of joint as finished are to be hammered with a peen hammer at a red heat to consolidate and give ductility to the metal, each hammering to cover a circumferencial space of from to 1 to $1\frac{1}{2}$ in."

This same general practice is used in connection with all welds and forms the basis of training the welders in the Grinnell Company. In regard to this matter of training it may be interesting to know that in earlier work the company attempted to train foremen and steam fitters in the art of welding with a view to having men who were skilled in the trade of steam fitting make an occasional weld when required. This practice was found to be a failure, as upon testing such welds they were quite often found to be unreliable. It would seem that a man to make the very highest class welds must keep in practice continually, just as in any other highly skilled art in which the hand plays a conspicuous part.

Switch Terminal Flashover Prevented

IN PROVIDING circuit-breaker equipment that will be adequate for rupturing current in circuits backed by concentrated generating capacity some companies have adopted units having muffler-type vents. Where they are used with breakers the tanks of which are alive, experience has indicated that precautions must be taken to provide ample clearance between the operating rod and the muffler; otherwise flashover may occur when the switch is in the open position. In the cases where this trouble has developed its recurrence has been prevented by replacing the metal caps of the muffler by others composed of insulating material such as bakelite. Aware of the fact just stated, some companies installing live-tank breakers with muffler-type vents are specifying that muffler caps of insulating material be installed. No doubt switch manufacturers will in the future forestall the possibility of trouble.

Night Routing Expedites Meter Work

METER setters and men engaged in "turn on and turn off" work in the meter department of the Kansas City Power & Light Company find their day's work laid out for them when they arrive at the shop in the morning and no delays are experienced in getting material together and arranging routes. The work of routing all orders for "turn ons and turn offs," running service and setting meters is taken care of by four men working on a night shift from 4 to 11 p.m. The same

arrangement applies to all materials used for service crews connecting services on premises. The cost of this extra night labor is more than offset by the saving in time and confusion of meter men trying to collect material and arrange their routes after arriving at the shop in the morning. Orders and material are grouped together by route and the man assigned to a particular route need only to call for his order and pick up his material on the way, and he is ready for his day's work.

Staggered Starting Times Used in Battery Charging

AN INTERESTING arrangement of battery-charging equipment which obviates the necessity of purchasing an additional motor generator was recently made by a Western company using a number of storage battery trucks. A 125-volt, multiple battery-charging motor generator was being used, the capacity of which was seven trucks charging at a 40-amp. rate. It was found necessary to double the number of trucks, and at first it seemed necessary to install a duplicate charging equipment.

An arrangement was devised, however, whereby the starting time of each battery was staggered and a consistently high load factor was maintained on the generator. Thus, batteries that had been charging for some time would gradually require less and less current until finally an additional battery could be added for charging. This was made a continuous process. The equipment used for the purpose was a General Electric CR-9390 solenoid-operated dial switch actuated by means of a type TR, form W, contact-making ammeter. The ammeter rotated the dial switch to increase or decrease the number of batteries connected to the terminals when generator amperage varied between predetermined limits.

The principle of electrical operation was as follows: A decrease of generator current below a fixed limit (in this case, 250 amp.) closed contact on the contact-making ammeter, rotated the dial switch, which bridged two studs on the dial, and energized a relay, which, in turn, short circuited a resistance in series with the contactor on the charging panel, permitting it to close. An overload caused the dial switch to operate in the reverse direction, bridging another set of contacts, which, in turn, short circuited the holding coil of the contactor, permitting it to drop out.

Ampere-hour meters with auxiliary contacts to disconnect the battery when charged were also installed, together with a plugging system to permit charging of trucks in any desired order, push-button stations to permit connecting any desired battery to the line without automatic operation and a reset switch for returning the dial switch to the starting point.

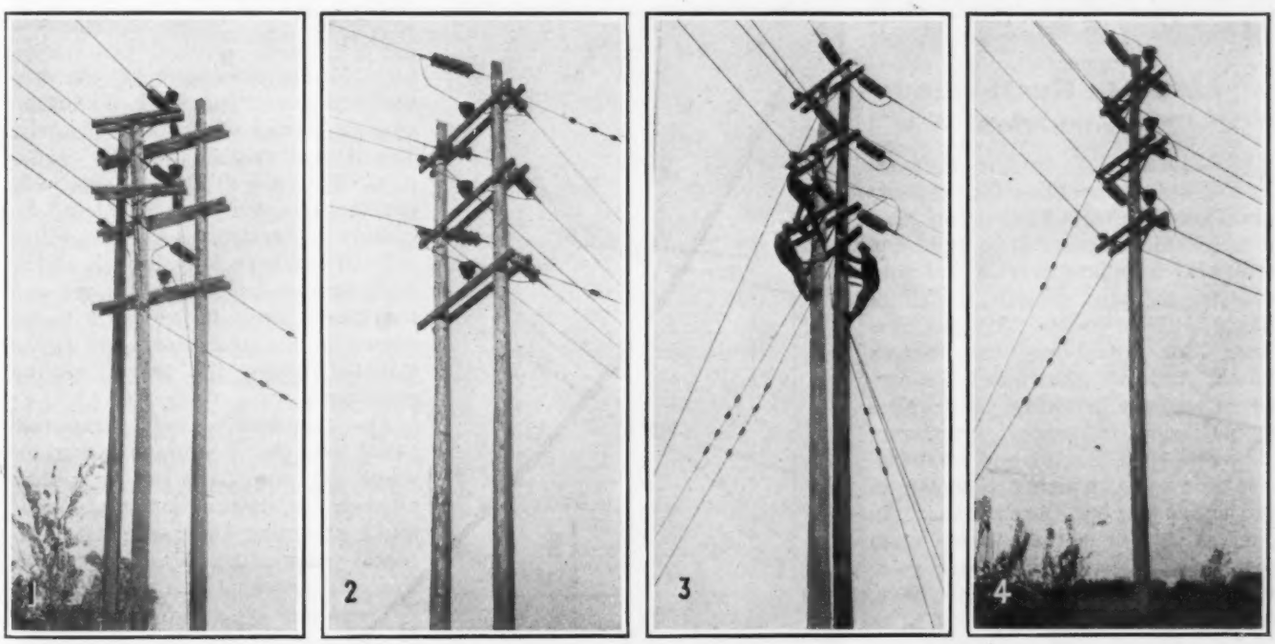
By this arrangement a consistently high load factor is maintained on the generator. The amount of installed capacity and the attention required by operators were also reduced to a minimum.

Storm Damages Repaired on Hot 66-Kv. Line

BY T. B. BASH
Superintendent Overhead Construction Department, Kansas City Power & Light Company, Kansas City, Mo.

DURING a recent severe electrical storm on the Higginsville line of the Kansas City Power & Light Company, lightning struck two poles carrying a three-phase, 66,000-volt, and a single-phase, 33,000-volt circuit, splitting the poles and causing crossarms to cant so that there was danger of the 66,000-volt circuit being shorted.

This condition of affairs was reported from the district to the load dispatcher and three hot line tool men with necessary equipment went to the seat of the trouble and without interruption to the 66,000-volt circuit or the 33,000-volt circuit installed an "H" fixture and transferred both lines to it. The 66,000-volt circuit was dead ended on one pole of the "H" fixture and each wire was jumpered around the pole to an insulator placed in the center of the "H" fixture. The 33,000-volt circuit was installed on the crossarms of the "H" fixture at the ends farthest from the 66,000-volt line. Fig. 1 shows



TWO JOBS OF STORM DAMAGE REPAIR CARRIED OUT WITHOUT SERVICE INTERRUPTION BY KANSAS CITY POWER & LIGHT COMPANY

this work under construction and Fig. 2 after completion.

The second trouble condition was identical with the first, but instead of installing the "H" fixture, which was impossible in the location, the lines were transferred to one pole, the 66,000-volt circuit being dead ended on the new pole and jumpered around on one side, while the 33,000-volt circuit was installed on the other.

The three linemen shown in Fig. 3 carried out the entire work in a highly satisfactory manner. Fig. 4 shows the pole after completion of the work.

The 66,000-volt circuit consisted of three No. 2/0 aluminum steel reinforced conductors and the 33,000-volt circuits consisted of two No. 4/0 steel reinforced aluminum conductors. The span lengths were 300 ft.; the crossarm spacing 6 ft.; the cross arm length 7 ft., and poles 50 ft. Poles struck by lightning were twenty spans apart and were located on corners carrying conductors at approximately 35 deg.

Limits to Rural-Line Construction

PRELIMINARY to the preparation of specifications for the most economical rural construction that it is considered possible to build and still give adequate service and provide for expected growth, the Great Lakes sub-committee on specifications for rural-line construction (F. E. Andrews, chairman) has prepared curves showing economical transmission distances, maximum allowable span lengths and comparative line costs, which are shown in the accompanying illustrations. In general, the figures are based upon the use of Western red cedar poles with "B" treatment, three-wire lines, and voltages ranging from 2,300 to 12,000 volts. It is assumed that conductors from No. 6 to No. 2, copper, and No. 6 to No. 0, aluminum-conductor steel-reinforced cable, may be used.

Calculations made with slide rule accuracy indicate that loads that can be carried with 68-in. spacing are only about 2 per cent less than for 53-in. spacing. Loads for aluminum conductor are within 2 per cent greater than those for copper of two sizes larger.

The curves for maximum allowable span indicate how this value is limited by strength of poles, allowable conductor tension and allowable horizontal spacing between conductors. Mechanical considerations were analyzed for copper and aluminum-conductor steel-reinforced cable only. The largest spans shown for aluminum, 480 to 590 ft., are probably greater than would be considered desirable in practice, the sub-committee pointed out, especially in view of the high tension in the conductors and the elastic limit to which it is assumed the conductor would be stressed under the worst loading conditions.

The comparative cost curves are based on the maximum allowable spans on the basis of maximum allowable conductor tension at elastic limit, assuming that adequate horizontal separation of pole strings would be provided in all cases.

These studies are indicative only of the trend of the final conclusions. Some consideration will be given to No. 6 steel-reinforced aluminum and to copper-clad and steel wire.

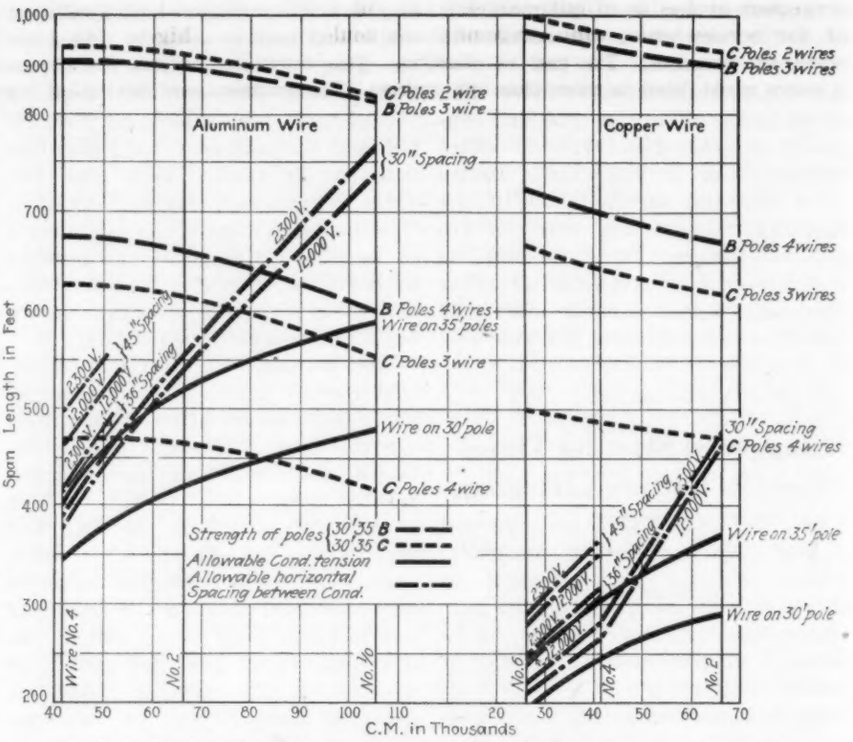


FIG. 1—MAXIMUM ALLOWABLE SPAN LENGTHS (DETERMINED BY GOVERNING CONSIDERATIONS IN NATIONAL ELECTRICAL CODE)

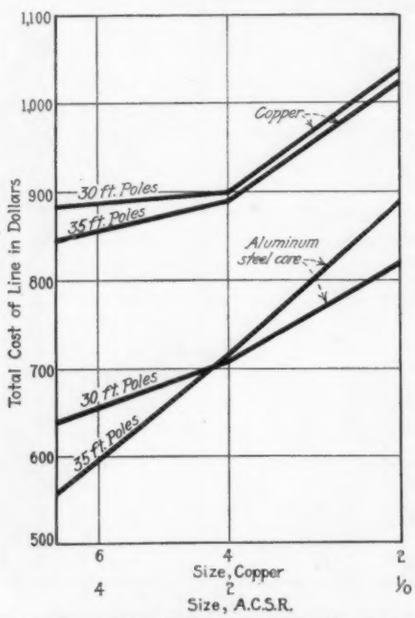


FIG. 2 — COMPARATIVE COSTS OF MAXIMUM ALLOWABLE SPAN LINES WITH DIFFERENT CONDUCTORS AND POLES

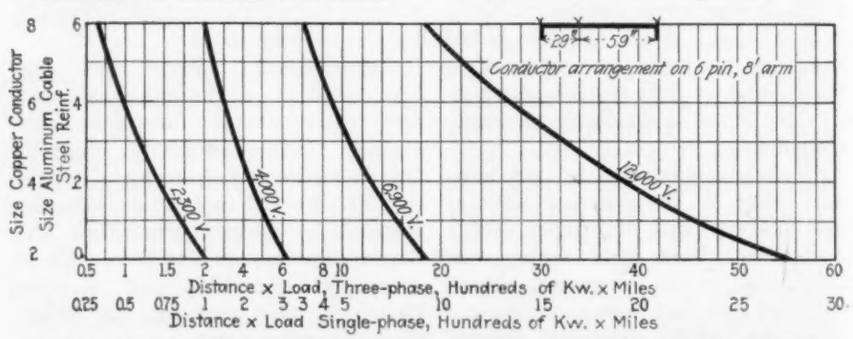


FIG. 3—KILOWATT-MILES WHICH CAN BE SERVED AT DIFFERENT VOLTAGES WITH DIFFERENT CONDUCTORS AND 5 PER CENT DROP OF RECEIVER VOLTAGE

Commercial Activities and Public Relations

Renting Electric Ranges

ALL precedent in the merchandising of electric ranges has been broken down by the Winnipeg, Canada, municipal system by a plan that provides for equipping apartment houses with electric ranges on a lease basis. The plan as first introduced in 1924 permitted tenants of apartment houses to use electric ranges on a rental basis, the consumer paying one cent per kilowatt-hour for maintenance of the range and one cent per kilowatt-hour for current consumed, less 10 per cent discount. The owner of the apartment house had the option of purchasing the range and equipment, including wiring, at any time during the life of the contract, at a price equal to the cost of the range and wiring less a depreciation of 8 per cent for each year the range had been in use. The effect of this arrangement was that the range and wiring automatically became the property of the apartment house owner in 12½ years without any cost to him whatever, the tenant having paid for the range.

By the end of 1924 ranges to the number of 1,741 had been installed under this plan, which, with 1,652 ranges sold to residential customers, brought the total ranges installed for the year up to 3,393. It appeared reasonable and equitable that the owner of the apartment house should bear some part of the expense and a somewhat modified plan was put into effect in August, 1925. The first scheme had the disadvantage that if one consumer's bill was $6 and another's $3, the first customer was paying $3 a month rental and maintenance, whereas the second was paying only $1.50. This objectionable feature was overcome by charging, in addition to the regular rate of one cent per kilowatt-hour for energy consumed, a flat amount to cover rent and maintenance. For ranges costing $70 or less (including a handling charge of $7 per range) this amount was fixed at $1.11 less 10 per cent, or $1 net per month. Where the cost of the range exceeds $70, the charge is $1.39 less 10 per cent, or $1.25 net per month. The apartment house owner assumes the cost of wiring by paying either all cash or $10 cash and $3 per half year per range or $2.70 net per half year for ten years. At $10 cash and $2.70 net per half year for ten years an amount of money is set up that is sufficient to cover the cost of wiring, including interest on the deferred payments. The Hydro's latest estimate for wiring is $40 per range.

After severe tests to determine the most durable ranges and those requiring the least maintenance three types of ranges were selected that are sold at prices ranging from $65 to $92.50. Maintenance costs kept on one of these type of ranges are said to be only 1.7 cents per month per range. Ranges are sold at wholesale prices plus a handling charge of $7 per range. The basis of the arrangement precludes any ranges costing more than $90 and the apartment house owner is required to pay in cash any excess over $90. The public utilities committee sanctioned this plan of equipping apartment houses with electric ranges on the basis of a report that showed that the city would realize a merchandising profit of $5,847 annually on 5,000 ranges. The estimated annual revenue from 5,000 ranges placed on the city lines is approximately $140,000. The plan now in effect provides for a return of 5¼ per cent on the money during the eleven years' time required to retire the investment.

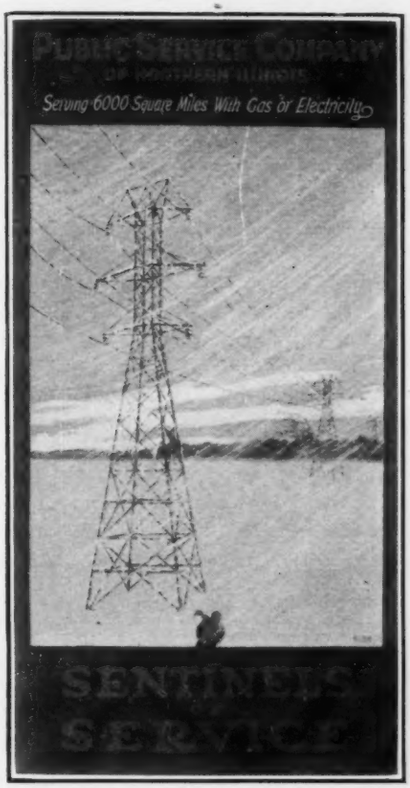
Detailed figures showing how the plan will operate are shown in the accompanying tabulation:

RENTAL AND MAINTENANCE OF ELECTRIC RANGES LEASED TO APARTMENTS

	Per Year
Cost of 2,500 ranges at $70 each.	$175,000
Revenue (from rental charge only):	
2,500 ranges at $1 per month per range, or $12 per year..	$30,000.00
Expenditure:	
Interest at 5¼ per cent on $175,000	9,187.50
Sinking fund, eleven years....	12,644.00
Maintenance at $1 per range per year	2,500.00
10 per cent vacancies.....	3,000.00
	$27,331.50
Annual estimated profit....	2,668.50
	$30,000.00
Cost of 2,500 ranges at $90 each.	$225,000
	Per Year
Revenue (from rental charge only):	
2,500 ranges at $1.25 per month per range, or $15 per year	$37,500.00
Expenditure:	
Interest at 5¼ per cent on $225,000	11,812.50
Sinking fund, eleven years...	16,258.00
Maintenance at $1 per range per year	2,500.00
10 per cent vacancies	3,750.00
	$34,320.50
Annual estimated profit....	3,179.50
	$37,500.00

In the city of Winnipeg there are 488 apartment blocks, of which 405 are served by the Winnipeg Hydro system. These 405 apartment houses contain approximately 5,000 individual apartments, and of this number 2,385 were equipped with electric ranges in the first campaign

Picturizing Utility Service



THIS effective poster is being used during the month of January throughout the territory of the Public Service Company of Northern Illinois. It is part of the company's continuous advertising, and the dramatic appeal—"Sentinels of Service"—is embodied in all of the company's publicity work. Displays of a series of these posters have been made in several of the company's offices, where they may be studied by students from the public schools and representatives of art societies.

from August, 1294, to June, 1925. From Aug. 15, 1925, to Oct. 30, 1925, 748 more ranges were installed in apartments, leaving 1,867 apartments still unequipped and representing potential customers. The several campaigns that have been conducted in the last year and a half have put out 4,330 ranges to all classes of consumers besides more than 1,000 water heaters, all of which has added 25,000 kw. connected load to the system and $140,000 in annual revenue. There are at present about 19,000 electric ranges served from the city lines with a total population reached of only approximately 200,000.

Ratio of Appliance Sales to Energy Revenue

THE relation between merchandise sales and the revenue accruing to the power company from the energy consumption of the appliances sold is shown in the accompanying summary of the appliance business of the Northern States Power Company during the year 1924.

For some appliances, such as the iron, the revenue from energy consumption, $6 per year, is virtually equivalent to the selling price of a good grade of this device, while on others the ratio of return is extremely low, as little as 1 to 50 in some instances. Taking the average, however, the merchandising business in this case will return to the company one dollar in gross annual revenue from energy sales for eight dollars' worth of electrical appliances sold.

ALABAMA POWER COMPANY'S WINDOW, THE LIGHTING OF WHICH WAS USED AS A MODEL BY 60 COMMERCIAL CUSTOMERS

Commercial Lighting Campaign Exceeds Quota by 40 per Cent

BY M. L. WILSON
Lighting Division, Commercial Department, Alabama Power Company

THE first store-lighting campaign initiated by the Alabama Power Company resulted in exceeding the sales quota set by 40 per cent. The campaign was carried on for 30 days in about 70 towns served by the company. The population of these towns totals 225,000. Thirty-five of these towns have a population less than 1,000 and thirteen towns are between 1,000 and 2,000. The quota called for 957 sales, and when the campaign ended 1,200 lamps had been sold.

The lighting unit used in this campaign is known as "Commercialite." The glassware is made of Hyperion glass, which allows a high percentage of the light to fall on the merchants' goods. Either a 200-watt or 300-watt type C Mazda lamp can be used in the unit. The price installed was $10.50, which included either of the lamps referred to. If a pull switch was desired, 75 cents was added. The method of payment was 50 cents with the first monthly bill after the unit was installed, the balance in five equal monthly payments. Also, as many units as desired were installed free for a ten-day trial if the customers so desired.

The schedule of the lighting campaign is given in the accompanying table. A feature of the program was a series of three sales letters closely followed up by personal solicitation from Alabama Power Company representatives.

With the last letter a folder describing the lighting unit and giving details of the offer was sent. In addition to these letters two "broadside" folders 17x22 in. were sent out, each pointing out the benefits of good lighting in stores.

The services of a lighting specialist from one of the large lamp manufacturers were engaged. He talked in the various towns and assisted in making lighting layouts and closing

SUMMARY OF ELECTRIC APPLIANCE SALES AND REVENUE FROM ENERGY CONSUMPTION

Northern States Power Company During 1924

Article	Total Appliances Sold, 1924	Average Wattage	Increase in Connected Load, Kw.	Est. Yearly Income per Appliance	Estimated Revenue per Annum
Irons	3,286	525	1,725.15	$6.00	$19,713.00
Toasters	1,329	450	598.05	3.60	4,784.40
Percolators	1,191	450	535.90	3.50	3,168.50
Grills	117	600	70.20	4.50	526.50
Curling irons	1,604	20	32.08	1.00	1,604.00
Air heaters	935	600	561.00	5.50	5,142.50
Heating pads	373	50	18.65	1.00	373.00
Portable lamps	676	50	33.80	6.00	4,056.00
Washers	1,917	175	335.48	2.50	4,792.50
Vacuum cleaners	1,486	160	237.76	2.75	4,086.50
Vibrators	88	50	4.40	1.00	88.00
Ironers (electric heat)	217	3,000	651.00	15.00	3,255.00
Ironers (gas heat)	396	175	69.30	6.00	2,376.00
Ranges	595	5,500	3,272.50	55.00	32,725.00
Hot plates	210	2,000	420.00	12.00	2,520.00
Waffle irons	522	600	313.00	2.50	1,305.00
Kelvinators	160	300	48.00	30.00	4,800.00
Fans	140	50	7.00	2.60	361.00
Toaster stoves	57	600	34.20	3.50	199.50
Water heaters	5	3,000	15.00	60.00	300.00
Sew E-Z motors	18	50	.90	1.00	18.00
Violet ray machines	90	50	4.50	1.00	90.00
Miscellaneous	2,838	20	56.76	.50	1,419.00
	18,250	....	9,044.63	....	$97,703.40
Total merchandise business, 1924					$842,430.00

SCHEDULE FOR STORE LIGHTING CAMPAIGN

Sept. 8: Mail Letter No. 1
Active Campaign
Week of Sept. 14 to 19
Sept. 14: Mail Letter No. 2
Newspaper advertisements
Show window display showing "Commercialite" unit Sept. 16: Mail Broadside No. 1 to prospects
Active solicitation

Week of Sept. 20 to 26
Sept. 21: Mail Letter No. 3 with folder "Commercialite"
September 23: Mail Broadside No. 2
Newspaper advertisements
Show window display showing "Commercialite" unit
Active solicitation

Week of Sept. 27 to Oct. 3
Personal solicitation
Follow up
Window display
Newspaper advertisements
Week of Sept. 3 to 15
Personal solicitation
Follow up

sales. Extensive advertisements giving the details of the offer and describing "Commercialite" ran in 35 newspapers during the first two weeks of the campaign.

To encourage salesmen, cash prizes of $25, $15 and $10 were distributed to salesmen who exceeded their quotas by the greatest percentage.

Employee Awards for Noteworthy Acts

THREE medals, of gold, silver and bronze, will be presented yearly by the Consolidated Gas Company of New York and its affiliated companies, including the New York Edison and the United Electric Light & Power companies, to employees for noteworthy acts and meritorious service.

The gold medal is the decoration of personal heroism on the part of an employee in rendering human service in his recognition of the high ideals of service which his company is pledged to render to the public, to the municipality or to his fellow employees; or the medal may be conferred upon one who makes an outstanding contribution to the gas or electric art. Silver and bronze medals will be awarded to those who make possible an improvement of the companies' service to the public, or greater comfort, knowledge and happiness of their customers and employees.

In making the announcement, George B. Cortelyou, president of the Consolidated Gas Company, said it was unquestioned that such recognition for well-earned distinction would enhance the spirit among employees of the affiliated companies and draw them and the public into closer community of feeling.

Washington Water Power Company Does Good Refrigerator Business

BY W. T. RYAN
Washington Water Power Company, Spokane, Wash.

SALES of domestic electric refrigerators by the Washington Water Power Company have been very satisfactory up to date and the company is making plans for a more active year during 1926. In 1924 the company arranged for distribution of the Electro-Kold machine, made in Spokane, and up to Jan. 1, 1925, 51 of these machines had been installed in Spokane. A sales engineer was appointed to carry on this work, and although it was pioneering in a new field, the results the first year were regarded as very satisfactory. Of the 51 units installed, 24 were put out subject to six months' trial, and every one was kept and paid for by the customer.

In the period from Jan. 1, 1925, to Nov. 1, 1925, 55 machines were installed, of which fourteen were put out on six months' trial. In the smaller towns served by the Washington Water Power Company, 48 machines have been installed this year with only half of the 24 principal towns demonstrating machines. During 1926 each town will have a demonstrator, and it is expected that sales for 1926 in these towns will reach a total of 100 machines or more.

The sales engineer in charge of this work has found that users become strong boosters, all having the conviction that the machine is a good investment. Many machines are being purchased by persons who have watched the performance of a neighbor's machine. He has noted that prospects know much more about domestic refrigerating machines than they did a year ago and that they are now more or less familiar with prices, servicing facilities and other important matters. He feels theerfore that the missionary work is over and that the market will henceforth respond to aggressive sales efforts.

Lifting Magnets Recover Steel from Acid Tanks

THE Trumbull Steel Company of Warren, Ohio, uses a lifting magnet for recovering valuable strip steel from pickling tanks. Frequently when the rolls of steel are lowered into the acid tanks the cradle accidentally slips or tilts, leaving some of the steel strip on the floor of the tank. To drain the tank would be costly in the waste of materials and time, and previous methods of grappling injured the metal. An Ohio Electric & Controller Company lifting magnet, provided with a special A-frame for supporting the lead-covered terminal leads of the magnet, solved the problem satisfactorily. Numerous methods employing lifting magnets for handling metal under corrosive baths have recently been applied with great economy.

WINDOW DISPLAY IN A SPOKANE BANK USED TO AID IN DOMESTIC REFRIGERATOR SALES

Digest of Electrical Literature

Hydro-Electric Developments and Steam Equipment

Steam Power in Its Relation to the Development of Water Power.—RICHARD C. POWELL.—In our water power we have a limited natural resource of great value but costly to develop, the end of the undeveloped water power in the United States being in sight. If a high load factor can be obtained, the total cost per kilowatt-hour is usually lower than it is for steam plants, but the output is limited by the stream flow. In general, the variations in flow do not coincide with load fluctuations, and the addition of some steam power will lower the cost of production. The author calls attention to the considerations which need to be taken into account and presents curves showing the influence of cost of plant, of fuel, of load factor and of the apportionment of the load on the power cost. Data for a practical case on a large scale are given to show what the use of auxiliary steam power may mean in the reduction of capital expenditures and generating costs.—*Journal A.I.E.E.*, December, 1925.

Pulverized Coal Systems of 1925.—FREDERICK A. SCHEFFLER.—Growth in the practice of using pulverized coal, it is stated, has been so rapid that the installations in operation and under construction cover 5,000,000 sq.ft. of effective boiler heating surface and will easily develop 1,000,000 hp. The power required to operate a completely equipped pulverized-coal-fired boiler plant on the storage system, including all auxiliaries within the pulverizing department, with transport system, drying, primary air supply and feeding coal to the boilers, is given as 17 kw.-hr. or 18 kw.-hr. per net ton of average bituminous coal, as a maximum, for installations using 150 tons or more per day. A number of recent installations are described and illustrated.—*Power Plant Engineering*, Dec. 15, 1925.

Comparison Between the Kaplan Turbine and Other Types of Water Wheels.—E. LÜTHY.—The Kaplan type of waterwheel is a turbine the runner of which has four vanes of a pitch which can be changed during the operation of the wheel. This hydraulic prime mover has been developed and improved in late years to a high degree of perfection, and it is today a serious competitor of Francis wheels for low and medium heads. The author goes into great detail in comparing these two waterwheels and comes to the conclusion that for hydraulic heads below about 45 ft. the Kaplan type is the more economical. A great number of performance curves, taken partly in laboratories and partly on actually installed wheels, bear out the author's claims. The fact that this turbine is from 15 to 50 per cent dearer than a Francis type for the same conditions is more than compensated by the much cheaper installation and the higher speed, the latter factor being responsible for a smaller and less expensive electric generator.—*Revue Générale de l'Electricité*, Nov. 14, 1925.

Fagundes Hydro-Electric Installation, Brazil.—The Fagundes is a small mountain stream with a minimum dry-season flow of about 2½ cu.m. per second during August and September and a flood flow of 100 cu.m. in the rainy season. It has a natural fall of 400 ft. in 1½ miles. At the head of this fall a dam has been constructed impounding 1,000,000 cu.m. of water, so that even in the dry season during peak loads the turbines can be operated at full output. The two turbines are of the Francis type, rated at 4,000 hp. each at a net effective head of 376 ft., the static head being 416 ft. The plant feeds into a 44,000-volt line from another plant close by. Most of the equipment was built in the United States, and the construction, as judged from the description and illustrations, seems in general to follow the usual practice.—*Engineering (England)*, Dec. 11, 1925.

Generation, Control, Switching and Protection

Generation and Application of Power.—A large portion of this issue is devoted to a group of articles written mainly from the administrative rather than the purely technical point of view and dealing with methods of insuring economical operation, particularly in the case of small parts. The means suggested are those with which power engineers are familiar, such as the critical supervision of each element of operation in the boiler room, the elimination of avoidable losses in the distributing system, the control of mechanical transmission and taking advantage of advantageous features in the rates for purchased power by peak-load and power-factor control.—*Industrial Management*, December, 1925.

Theory of Induction Voltage Regulator.—A. BRUNN.—This paper is one of the most complete articles published in recent years on the theory, the use and the testing of induction voltage regulators. In the 20 chapters of the treatise the author describes first the growing importance of these regulators for generating stations and then develops vectorial diagrams for the single-rotor and the double-rotor machine. He demonstrates how these diagrams can be used readily to calculate the wattless energy and the torque of regulators. Describing the problem of circulating currents between parallel operating or tied power stations, it is shown graphically that induction voltage regulators may in such cases be advantageously used as phase regulators. Actual examples with concrete figures illustrate the method of utilizing the diagrams for the solution of this problem. Of the various ways in which a regulator can be connected to the line, the author indicates those which give best results for the intended purpose. Finally some valuable pointers are given as to how the manufacturing plant should test regulators to insure proper connection and adjustment. The paper is illustrated with 25 figures and covers 33 pages.—*Bulletin de l'Association Suisse des Electriciens*, November, 1925.

Transmission, Substations and Distribution

Mechanical Characteristics of Transmission Lines.—XI—Construction of Long Spans.—L. E. IMLAY.—The present installment discusses considerations that must be taken into account in the design of particularly long spans. These are primarily matters of mechanical strength and include stresses in the towers, stresses in the cables and sag. On these points the author gives data relating to physical properties and current practice. A number of notable long spans are described in some detail.—*Electric Journal*, December, 1925.

French Outdoor Substation.—J. PLANTEAU.—Twelve miles from Paris a 9,000-kva. substation was built to supply Pontoise with electric service. Two three-phase 60,000-volt lines connect this station with the Parisian public service system. The entire installation, including the 15,000-volt section, is of the outdoor type. Its design, operation and safety features are a radical departure from the customary type. The author goes into detailed descriptions of all parts of the plant, emphasizing in particular features used for the first time. An interlock, for instance, is provided on the power transformer switches so as to trip both of them if either the low-voltage or the high-voltage breaker opens. As there is no direct current available in the station, all the electric remote-control apparatus is operated by alternating current. The breakers are closed by heavy springs, which have been previously put under tension by a small motor. This operating mechanism, mounted with its relays in a large cast-iron box, is installed several feet away from the breaker which it controls. In a small operating room near the station, from which all the various apparatus can be controlled, is an automatic load-control system, which connects one, two or all three of the 3,000-kva. transformers to the buses, according to the load demand. To disregard temporary load peaks, the relays accomplishing this paralleling of transformers have adustable time-delay contactors, the principle of which is that a certain amount of mercury has to be displaced before the transformer switch is closed.—*Revue Générale de l'Electricité*, Nov. 21, 1925.

Units, Measurement and Instruments

Electrical Conductivity of Certain Light Aluminum Alloys and Copper Conductors as Affected by Atmospheric Exposure.—ERNEST WILSON.—The paper brings together the results of a series of exposure tests which have been in progress since 1901. Twenty-five alloys of aluminum with copper, nickel, manganese and zinc in quantities not exceeding 1 or 2 per

cent have been tested at intervals. In all cases the resistance has increased materially, by amounts ranging from 10 to 30 per cent. With copper alone, or copper and manganese, the conductivity continually decreases. Other alloys follow a less simple law. The factors concerned are the specific resistance of the alloy and the loss of metal by corrosion. It has been found possible to separate the total variation into these two classes. The results of the study are tabulated and charted.—*Journal I. E. E. (England)*, November, 1925.

Thermocouples for Temperature Measurement.—A. SCHNETZLER.—The most commonly used metal combinations for thermo-electric temperature measurement are described in this paper, and methods for their calibration are given. It is shown that the emf. produced is not only a function of the temperature difference between the cold and the hot end of the couple, but also of obtaining absolute temperature. The author derives formulas which permit calculating the emf. for a given coefficient and temperature, and he indicates also graphical means of solving this problem. The actual temperature measurement may be accomplished either with calibrated millivoltmeters or with a shunt method, counter-emf. and a null instrument, or, finally, with a second thermocouple counter-connected with the first one over a galvanometer, the auxiliary couple being submerged in a liquid the temperature of which is measured with an ordinary thermometer. Most of the calibration curves given in the paper concern copper-iron and copper-constantan couples.—*Bulletin de l'Association Suisse des Electriciens*, November, 1925.

Illumination

Lighting Peterborough Cathedral.—It is only in recent years that an adequate solution of the problem of artificially lighting such an edifice as a cathedral has become possible. In the new installation in the Peterborough (England) cathedral the nave is lighted by 250-watt units placed on either side of the clerestory windows, so that the artificial light comes from nearly the same direction as daylight. Each unit consists of a specially designed projector comprising three silvered glass mirrors mounted in a suitable case and equipped with a projector-type gas-filled "Mazda" lamp. The beams are trained diagonally downward across the cathedral toward the bottom of the piers on either side of the nave. The portion of the beams which would otherwise be split on the edge of the clerestory is deflected upward to illuminate the upper part of the walls and the roof. At the "crossing" beneath the central lantern tower eight special units are mounted nearly 100 ft. above the floor, each provided with a single silvered-glass reflector and a device to prevent the light "splashing" on the walls in the upper part of the tower. The lighting of the eastern end of the apse and in certain other situations is effected by "Mirolux" trough reflectors fixed in a suitable position in the triforium and clerestory. The units are finished in a light buff tint to render them inconspicuous and where possible are concealed from the view of the congregation. The units are controlled by contactor switches operated from push-button panels behind the choir stalls.—*Electrician (England)*, December 4, 1925.

Motors and Control

Direct-Current Reclosing Equipments in Industrial Service.—E. L. HOUGH.—This article contains a brief description, with diagrams and views, of equipment which disconnects a feeder on overload and automatically reconnects it to the bus when normal conditions have been re-established on the line. After a predetermined time interval a relay operates to "feel out" the load. This is accomplished by closing the circuit through a resistance. If the load has fallen to a safe value, its voltage, reduced below the bus voltage by the drop through the resistance, will be high enough to actuate the relay and cause the main contactors to be closed. Independent adjustments are provided for the overload, time delay and reclosing values.—*General Electric Review*, December, 1925.

Electricity in the Iron and Steel Industry.—JOHN C. REED.—In this paper, presented before the Philadelphia Section, A. I. and S. E. E., on May 8, the author describes electric power applications, starting with the blast-furnace department and taking up practice in the open-hearth department, the use of main rolling-mill motors and reversing-mill drives, mill tables, roughing mills and finishing mills. The data include information on the rating and type of motors for various kinds of service and on control equipment, with circuit diagrams and views.—*Iron and Steel Engineer*, November, 1925.

Influence of Voltage Variation Upon the Performance of Induction Motors. A. PICARDAT DE PUTHAUX.—This paper contains practical data showing how existing induction motors can be rewound to operate under different conditions from those for which they were originally designed. For example, the necessary changes on a 20-hp. motor to enable it to deliver only 10 hp. with otherwise unchanged characteristics are described. Another case indicates how a motor which is found to operate at a low power factor can be improved for certain load conditions by rewinding it for a different voltage. All data given are sufficiently general in nature to be useful for a considerable range of motors and voltages.—*Revue Générale de l'Electricité*, Nov. 7, 1925.

Heat Applications and Material Handling

Arc-Welding of Cast Iron. — H. NEESE. — Electrical arc welding of broken cast-iron parts is frequently called impossible or difficult simply because an attempt is made to proceed in a way similar to that customery for steel welding. Under such conditions a very unsatisfactory welding seam will result, chiefly on account of great internal stresses being set up in the welded parts. A method of welding is now suggested whereby the weld will be as sound as the remainder of the casting. The pieces must first be heated red-hot, and when at this temperature the welding should be done with a cast-iron rod electrode using very high current, not less than 500 amp. at 65 volts. This comparatively large amount of energy enables the welder to keep the welding zone as a puddle of entirely liquid cast iron, resulting in a ready amalgamation without slack, pores or gas bubbles. Several illustrations show successful welds made on large castings for presses, pumps and engine frames.—*Zeitschrift des Vereines Deutscher Ingenieure*, Nov. 7, 1925.

Ribaud High-Frequency Furnace.—The high-frequency currents in this furnace are obtained from the oscillatory discharge of a condenser through a rotary spark gap driven by a small auxiliary motor. With materials of intermediate conductivity the currents are produced in the metallic mass itself; with highly conducting materials, such as copper or aluminum, they have to be induced in the walls of the containing vessel. With the former substances, therefore, carbon contamination can be entirely avoided by the use of a bauxite or magnesite crucible, the heating being more rapid if they are in a flaky or lumpy condition. A recent test is described in which a charge of 6 kg. of electrolytic iron was melted in forty minutes with an initial input from the 110-volt supply of 10 kw. to 12 kw. Toward the end of the run the furnace meter showed a current of 80 amp. to 82 amp. The statement as made permits of some uncertainty as to the total energy consumption. A temperature of about 1,600 deg. C. was attained.—*Electrician (England)*, Nov. 27, 1925.

Traction

Oil-Electric Locomotive.—A run is reported of a 100-ton oil-electric locomotive built for the Long Island Railroad in which a distance of 537 miles was covered with a train weighing 377 tons, including the locomotive, and on a total fuel consumption of 473 gal., or an average of 6.35 lb. per mile. The two 300-hp. oil engines are of the vertical, six-cylinder, four-cycle, single-acting, variable-speed type, having direct fuel-oil injection. They are direct-connected to two 200-kw., 600-volt, compound-wound, direct-current generators, which supply current to four single-geared series motors. No rheostats are used in the control system; the electrical master controller connects the motors in series or parallel, forward or backward. Other than that the speed is governed by a throttle lever which controls the output of the engines. The article from which this information is taken includes further figures on the test and data on the dimensions of the locomotive.—*Railway Age*, Dec. 26, 1925.

Vienna Stadtbahn Electrification.—Opened as a steam line, the Vienna Stadtbahn extends through the center of Vienna on embankments and in cuts and tunnels. The road, having been constructed for strategic purposes, was built according to the trunk-line standards of Austria. The present electrification adds 16.7 miles to the city's 168

miles of street-railway system. It operates on 750 volts, with cars that are also available on the 500-volt street railways. Special features are the use of catenary construction with a view to eventual higher speeds, with contact wires of grooved cadmium copper having a cross-section slightly less than No. 00 B. & S. gage, carried two per track, and mercury-arc substations.—*Electric Railway Journal*, Dec. 5, 1925.

Telegraphy, Telephony, Radio and Signals

Application of the X-L Filament to Power Tubes.—J. C. WARNER and O. W. PIKE.—The properties of the thoriated-tungsten filament are discussed with particular reference to the suitability of this material for use in power tubes and its advantages over other materials. Comparisons are given between pure-tungsten and thoriated-tungsten filaments in electron emission characteristics and the effect on tube design and performance. Several power tubes containing X-L filaments are described in detail, and the improvements are shown by comparison with older tubes using pure-tungsten filaments. — *Proceedings of I. R. E.*, October, 1925.

Recent Advances in the Communication Art.—This is a report of the committee on communication, presented at the annual convention of the A.I.E.E. A summary of it may be found in the ELECTRICAL WORLD report of the convention, July 4, 1925, on page 14.—*Journal A.I.E.E.*, December, 1925.

Birmingham Broadcasting Station.—E. M. DELORAINE.—Aside from the descriptive matter applying to the remodeling of a specific station, this article is of more general interest to the communication engineer for its broad review of the problem of faithful reproduction of speech and music, including an analysis of the nature of the distortions introduced at various stages between the original source of sound and the hearer, and its discussion of possible methods of balancing these distortions for best results. From curves accompanying the article it appears that if the distribution of energy in the side band follows faithfully the distribution in speech the amplification is limited by the intensity of the lower frequencies, since this determines the load on the amplifiers. The range therefore is less than if intelligibility is the criterion; that is, true quality and maximum range cannot both be secured. Discrimination in the transmitter against the lower frequencies and in the receiver against the higher ones would give satisfactory reproduction but would probably necessitate different adjustments for different broadcasting stations and hence is objectionable. The author suggests as a solution that for news bulletins maximum range might be adopted, since quality here is of secondary importance, whereas for addresses and for music the station should remove such modifications of the transmitter, to secure faithfulness, even at the expense of range. Among the charts are "sound spectra" of various musical tones, response characteristics of telephone receivers and loud speakers, and curves relating audibility, acoustical frequency and energy, all plotted to logarithmic scales, since the energy ratio, for example, extends from 10^{-8} through unity to 10^{+3}.—*Electrician* (*England*), Oct. 9, 1925.

Miscellaneous

Small Wind-Power Plants.—K. LUBOWSKY.—The author claims that bombastic and untruthful propaganda, together with very cheaply built apparatus, has largely undermined public confidence in the possibility of utilizing wind as motive power for small isolated electric plants. Progress made in the design of modern wind turbines, however, combined with substantial and rugged constructions, guaranteed to give a useful life of 20 or more years, make this type of prime mover, if properly selected and installed, a formidable competitor of any kind of thermal engine. Systematic observations made in various countries for many years have indicated uniformly that at great heights wind velocities are much higher and much more uniform. Low towers for wind wheels are therefore poor economy. The four-vane propeller type of wheel is more advantageous than the customary polyvane wheel for high-voltage wind velocities such as obtain in mountainous regions or on coasts. For small capacities up to 3 kw. the hub-mounted dynamo is preferable to a ground-installed engine, because the long transmission consumes frequently 25 per cent of the available energy. The author recommends for medium-size wheels the use of a rotary-type generator, which delivers simultaneously direct current for battery charging and three-phase current for transmission. During periods without wind the machine acts as a motor-driven alternator. Unit manufacture in large numbers of the 3-kw. size for export purposes constitutes at present a sizable business for European manufacturers. — *Elektrotechnik und Maschinenbau*, Nov. 22, 1925.

New Books

Power Plant Lubrication

By W. F. Osborne. 275 pages, illustrated. New York: McGraw-Hill Book Company, Inc.

This is a practical book for the power-station engineer. It covers the physical and chemical properties of lubricants, their action when subjected to heat and pressure, and testing methods. A detailed discussion of methods of applying lubricants to machines is particularly valuable, and the author includes a good treatment on specifications for lubricants and standard tests and analyses. The book is written for the practical man and is well illustrated.

The Induction Motor

By Herbert Vickers. 322 pages, illustrated. New York: Sir Isaac Pitman & Sons.

A thorough and complete textbook on all types of induction motors. It deals with the latest developments in speed and power-factor control and includes a modern treatment of the theory of induction motors and their applications. A list of chapter headings will give a good perspective on the contents: "Polyphase Induction Motors," "Single-Phase Induction Motors," "Starting Devices for Single-Phase Motors," "Synchronous Induction Generator," "Electric Braking," "Induction Motor as a Phase Converter," "Regulation and Stability," "Revolving Field in Polyphase Motors," "Speed Controls," "Phase Advancing," "Induction Motor with Direct-Current Secondary Excitation," "Testing," "Windings," "Starting Devices," "Design," "Rating" and "How to Adapt Windings to a Given Frame."

The design element predominates in the treatment, and the scope of the work is so large that the author has been compelled to condense his material greatly. The treatment is mathematical and graphical and incorporates most of the considerations in modern design. The work should be welcomed by teachers and consultants and by schools that give a thorough study to induction machines.

Book Notes

Mechanical World Year Book for 1926. Manchester, England: Emmott & Company.

This volume is a compilation of notes and data tables referring to prime movers of heat-energy types, mechanical power transmission, machine-shop practice, structural and other steel uses. Conversion, equivalent, mathematical and other tables are included. The book is less a technical handbook for engineers than a manual for mechanics, and for the latter use it should be valuable. The present edition contains several new sections—notes on uniflow engines, grinding and abrasives, forced and shrinkage fits, chain and rope tackle—as well as differing from previous editions in the revision and enlargement of existing sections.

Six-Place Tables. By E. S. Allen. With notes. Second edition. 144 pages. New York: McGraw-Hill Book Company, Inc.

This selection of tables has proved very popular, and the usefulness of the second edition has been increased by the addition of tables of natural logarithms, of exponential and hyperbolic functions and of integrals. The publication is arranged in a convenient pocket size and covers all tables useful to engineers.

Books Received

The Induction Motor in Theory, Design and Practice. By Herbert Vickers. New York: Sir Isaac Pitman & Sons, Ltd. 322 pages, illustrated. Price, $6.

Die Leistung des Drehstromofens. By Dr. Ing. J. Wotschke. Berlin: Julius Springer. 70 pages, illustrated. Price, 5.10 goid marks.

Six-Place Tables. With explanatory notes by Edward S. Allen, associate professor of mathematics, Iowa State College. New York: McGraw-Hill Book Company. 144 pages. Price, $1.25.

Telephone Communication Systems. By Royce Gerald Kloeffler. New York: Macmillan Company. 284 pages, illustrated.

Modern Picture Theater Electrical Equipment and Projection. By R. V. Johnson. London: Crosby Lockwood & Son. 169 pages, illustrated. Price, 15s. net.

News of the Industry

Smith's Stand Less Radical

Governor of New York, Again Advocating "Power Authority," Modifies His Former Views

"IT DOES not mean that the state is going into the business of dealing in electrical energy," said Governor Alfred E. Smith in his annual message to the New York State Legislature, delivered at noon on Wednesday of this week, when he once again advocated the creation of a "State Water-Power Authority" to develop state-owned power. On this subject Governor Smith was less radical than in previous messages, in which he leaned strongly to the position that the state should generate, transmit and sell electricity.

"During the past year," this week's message said, "revenues in the state from the use of surplus canal waters have been materially increased, and it is worth noting that the rental of the power developed by the state itself at Crescent Dam and Vischer's Ferry represents 10 per cent upon the state's investment. All of our experience clearly demonstrates that we can make use of these great natural water-power resources for the benefit of the people and can do it with financial profit to the state itself. . . . In my messages of 1924 and 1925 I advocated a definite, concrete plan. I would ask you to examine again those passages descriptive of the creation of a 'State Water-Power Authority.' In conformity with the letter and spirit of the reorganization amendment, the Water-Power Authority should be set up with the Conservation Department. I am certain that no sane or even reasonable argument can be made why these great water powers should remain undeveloped when a power agency, a quasi-public corporation, municipal in character, without stockholders, can be erected to develop the state's power resources without cost to the taxpayers. Neither the money nor the credit of the state need be pledged. No state bonds will be required. It does not mean that the state is going into the business of dealing in electrical energy. All that is required is that the state itself shall own, control and develop water power at the source."

Upon the subject of control of public utilities the Governor said:

"It is a fixed policy of the state to confer power upon local authorities to settle all matters of purely local concern. In pursuance of that policy the state should return to the municipalities the free hand they once had to deal for themselves with the corporations with which they made contracts at any time in the past. I was never able to find any fault with a policy of decent decentralization that would delegate to municipalities, where they desired to exercise it, the right of the state to regulate all public utility corporations operating wholly within their borders.

"Municipalities should also be free to supplement existing public utilities where their necessities require it without consent from the state, however desirable such a procedure may be in the case of private corporations. Municipal ownership is not new. Several cities of the state not only own but operate public utilities of various kinds."

Governor Fuller Would Add to Commission's Powers

In his inaugural message to the Massachusetts Legislature on Wednesday of this week, Governor A. T. Fuller advocated giving the Department of Public Utilities the right to determine what constitutes a fair and reasonable dividend in the case of any particular utility, urged further control of utilities through the dissolution of domestic corporations a majority of whose stock is owned or acquired by foreign trusts or associations, and advocated making contracts for the sale of power between companies subject to approval by the department.

Municipal Ownership Fails to Enter Cambridge, Mass.

By a vote of nine to six the Cambridge (Mass.), City Council last week killed the proposal for municipal ownership of the local electric lighting company's plant. This outcome was anticipated in a previous issue of the ELECTRICAL WORLD. At no time during the agitation was there any marked public sentiment in favor of the project or any real evidence of popular feeling that the Cambridge Electric Light Company was not rendering admirable service at reasonable rates.

Anticipated Georgia Merger Goes Through

The anticipated purchase by the South Georgia Power Company of Albany, Ga.—owned by and subsidiary to the Columbus Electric & Power Company, a Stone & Webster property—of the Georgia-Alabama Power Company and its subsidiary, the South Georgia Public Service Company, has been consummated, according to Atlanta advices to the ELECTRICAL WORLD, and the operation of these properties has been taken over. The purchase price is said to be $5,000,000. Extensive improvements are expected to follow.

The South Georgia Power Company has a total generating capacity of 15,000 hp. with additional steam plants which can be used in emergency. It owns nearly 200 miles of 44,000-volt transmission line reaching a large number of the more important towns in southwest Georgia, among them Americus, Cordele, Tifton, Pelham, Sylvester, Smithville, Leesbury and Fort Gaines.

Ontario Hydro in 1925

Chairman Magrath Reports Total Load of 900,000 Hp.—Fourteen Thousand Rural Consumers

THE outstanding accomplishments of the Ontario Hydro-Electric system during the year just ended are dealt with by C. A. Magrath, chairman of the Hydro-Electric Power Commission, in a special New Year's interview. The progress made by the system during 1925, he holds, has been gratifying. Among other things, Mr. Magrath says:

"During the past year there has been a steady growth in the demand from municipalities for electrical energy, and new equipment has been placed in operation as rapidly as it could be installed. On the Niagara system units Nos. 8 and 9 have been completed at the Queenston-Chippawa plant, which under test has carried a peak load of 550,000 hp. A year ago it was estimated that the load on the Niagara system might during the year reach about 715,000 hp., but this demand has been exceeded, and, under conditions similar to last year, the maximum peak has actually reached 750,000 hp.

"The total load served by the commission during the year for its various systems is about 900,000 hp. When it is realized that all the plants that the commission has under construction will, when entirely developed, yield about 1,000,000 hp., it is obvious that the remaining margin of security against an oncoming power shortage is even less than it was estimated to be a year ago.

"With regard to the progress of the supply of electric light and power to rural districts, it may be stated that there has been a steady growth in this branch of the commission's work. There are now nearly 14,000 rural consumers, served by means of 1,500 miles of primary line. The capital expenditure for the rural work is about $3,200,000.

"The past year was the first for the operation of the new consolidated Georgian Bay system. The commission completed the extension to the South Falls generating station on the Muskoka River, which increases the output of this plant by approximately 3,500 hp. An additional extension is partly completed which will provide a new unit of approximately 2,000 hp. at Hanna Chutes, thus making a combined increased capacity of about 5,500 hp. on the Georgian Bay system. The total generating capacity serving the Georgian Bay district is about 25,000 hp.

"The demand for power on the Central Ontario and Trent system shows a steady normal increase. The total available generating capacity is now a little over 47,000 hp., including the two new generating stations at Dams Nos. 8 and 9 on the Trent River, which have a combined rating of about 11,000 hp.

"The development of the power markets in the Thunder Bay district has exceeded the commission's estimates,

and the pronounced demand for additional power stands out in marked contrast to the pessimistic criticism that has been directed against the commission's activities on behalf of the Thunder Bay district. The load of about 7,000 hp. which the commission had in 1920 has increased until today the commission is supplying not only 40,000 hp. to its own customers, but in addition from 4,000 hp. to 6,000 hp. to aid the Kaministiquia Power Company to take care of its business in Fort William and vicinity.

"The commission's Port Arthur load is about three and a half times the size it was at the beginning of 1921. By the installation during the past year of two new units, Nos. 5 and 6, the commission has increased the generating capacity of its plant to 75,000 hp., and the plant has already delivered on peak load nearly 49,000 hp. During the year the commission constructed for Port Arthur a new terminal station, which includes the most modern 110,000-volt equipment."

TORONTO CHAIRMAN OPTIMISTIC

Chairman P. W. Ellis of the Toronto Hydro Power System takes the stand that there is no fear of an immediate shortage of power in Ontario. This is contrary to the view which has been expressed by other authorities recently and is hinted at in Commissioner Magrath's report. In a letter to the Mayor of Toronto Mr. Ellis says: "While there appears to be an impression here and there in the public mind that the supply of power for domestic use in Toronto and elsewhere throughout the province is liable to be curtailed, the existing conditions, while requiring careful consideration, are not, in the opinion of your commissioners, such as to justify alarm or apprehension."

Electric Fires Heat Political Pot

Congress Once More Talks Muscle Shoals—Norris' Public Ownership Bill—House Slow to Block Colorado Development—Proposed Survey of Power Sites

BY A VOTE of 248 to 27, the House of Representatives on Jan. 5 passed the resolution providing for further study of the Muscle Shoals problem by a joint congressional committee. The committee is to be composed of three members of the Senate committee on agriculture and three members of the House committee on military affairs.

The committee is directed to conduct "negotiations for a lease of the nitrate and power properties of the United States at Muscle Shoals, including the quarry properties at Waco, Ala., for the production of nitrates primarily and incidentally for power purposes, in order to serve national defense, agriculture and industrial purposes and upon terms which so far as possible shall provide benefits to the government and to agriculture equal to or greater than those set forth in H. R. 518 [the original Ford offer], except that the lease shall be for a period not to exceed fifty years." The committee is instructed to report not later than April 1 and "shall have leave to report its findings and recommendations, together with a bill or joint resolution for the purpose of carrying them into effect."

Representative Snell, the chairman of the rules committee, and Representative Bankhead of Alabama spoke strongly in favor of the proposed nitrate plant. Representative Burton of Ohio regarded the reference to the Ford proposal as unfortunate, holding that offer to have been "utterly inadequate." Representative Huddleston of Alabama said the resolution would not get through the Senate and would simply place Muscle Shoals in the hands of its enemies. Representative Williamson of South Dakota denounced the plan. Freight rates are such, he declared, that fertilizer made at Mussle Shoals cannot be transported beyond a radius of 300 miles. Representative La Guardia of New York made a straight-out public ownership speech.

Extreme ground was taken in the Senate by Senator Blease of South Carolina, who declared the government took the water power and gave it to corporations.

Senator Norris' New Bill for Public Ownership

A Muscle Shoals bill somewhat altered from his bill of the last Congress was introduced on Jan. 5 by Senator Norris of Nebraska. The measure separates the power and fertilizer operations at Muscle Shoals and proposes the creation of a Federal Power Corporation to have complete control of the power generated there. The corporation is to be administered by a board of directors, to be paid at the rate of $10,000 annually. The board is to consist of Morris L. Cooke, the director of the Giant Power Survey in Pennsylvania; James D. Ross, the superintendent and chief engineer of the municipal hydro-electric plant at Seattle, and John R. Neal of Knoxville, Tenn., who is a prominent opponent of the granting of private applications on the upper Tennessee River.

The corporation is authorized to build transmission lines and to sell power. In the sale of power preference is to be given to states and municipalities. The nitrate plants, under Senator Norris' proposal, would be turned over to the Secretary of Agriculture. The Power Corporation would furnish electrical energy for the operation of these plants at cost.

The Indirect Attack on the Water-Power Act

That the House of Representatives will not act hastily on the Pittman resolution, sent from the Senate, which, as reported last week, suspends the authority of the Federal Power Commission to issue licenses on the Colorado River, is assured by its reference to the committee on interstate and foreign commerce. This action was not taken without deliberation. There was demand that it go to the committee on irrigation of arid lands, where a favorable report probably would have been forthcoming in short order. The public lands committee, which handled water-power maters prior to the formulation of the water-power act, also was a contender for the bill. Some predict that the resolution never will emerge from committee as it is believed that a majority of its members do not want to see restored the embargo on hydro-electric development which existed for ten years prior to the enactment of the water-power act. Besides opposition from constituents who do not want to see the water-power act set aside even for short periods in restricted localities, those who are interested in financing water-power development are protesting against allowing the act to be whittled away just as the financing of projects under it is beginning.

None the less, a further resolution suspending the right of the Federal Power Commission to issue licenses on the Tennessee River was introduced in the upper House by Senator Norris on Jan. 4. His position is that no disposition should be made of rights on the river until it is known what is to be done with the government's properties at Muscle Shoals. Senator McKellar of Tennessee indulged in an attack on the Corps of Engineers and the General Electric Company, from which Senator Underwood of Alabama dissented. The Norris resolution was referred to the agricultural committee, of which the Nebraska man is chairman.

The Proposed Survey of Nation's Water Resources

In a report to the committee on interstate and foreign commerce of the House of Representatives, the Federal Power Commission approves the proposed legislation to grant the United States Geological Survey adequate funds for preparing an inventory of water resources, but it opposes the granting of general authority to the Survey to prepare comprehensive plans of water development for all purposes.

"The preparation of general plans of river development," says the commission in its report, which is signed personally by each of the three Cabinet members composing it, "not only requires the appraisal and use of the fundamental physical data but it involves also consideration of economic factors and of specialized data which belong to the specific fields of development, such as irrigation, water power and navigation, which must be co-ordinated in any general plan. No single governmental agency has all this specialized information in its possession or can secure it without extensive and wholly unnecessary duplication of the activities of other agencies. . . . The commission is of the opinion that only through the co-ordinated action of the three departments interested will it be practicable to prepare general plans which would adequately solve the problems or receive public confidence."

Fearing that any general survey of rivers may be seized upon as an excuse to prevent the earliest possible development of power projects, General Harry Taylor, the Chief of Engineers, probably will recommend against any

broad program of river surveys at this time.

The recent National Rivers and Harbors Congress in adopting a resolution covering the proposed general survey of rivers emphasized that these studies were not to be construed as reason for delay in granting permits and licenses, but a proviso to that effect was omitted inadvertently from the copies of the resolution distributed after the convention.

La Guardia Reintroduces Bill Aimed at Federal Courts

Representative F. H. La Guardia of New York has reintroduced in the Lower House of Congress his bill designed, in his own words, "to limit jurisdiction of the federal courts in order to prevent public service utilities' abuse of these courts to avoid state laws and rules and orders of state commissions and administrative state boards." The bill has been referred to the committee on the judiciary. In the last Congress it failed to get a hearing.

Sarasota, Fla., to Vote on Sale of City Plant

Sarasota, declared by its citizens to be one of the most flourishing of the cities in embryo which have sprung up in Florida in recent months, is to vote on Jan. 12 on a proposal to sell its electric light plant to the Florida Power & Light Company for $1,000,000. Advocating the acceptance of the offer, the Citizens' Committee, of which A. B. Edwards is chairman, says in a public advertisement:

"The Florida Power & Light Company has offered us $1,000,000 for our electric plant. When contemplated improvements are made it will have cost us $590,000. The company offers to build a new power house on an island to be made by dredging a channel to provide deep water. We are simply asked to trade our power plant for deep water. We are assured the best of electric service by the largest company in the business, a company that in two years has already invested $50,000,000 in Florida. This is far different from the small company we formerly had here!

"The proposed plant would be three times the size of the present plant. It would be a *super*-power plant. The company wishes to build a plant capable of supplying the entire section as far as Wauchula and Arcadia. Our charter would prohibit us from doing this. The company would secure quantity production and thereby would employ machinery and man power of a higher type that we can afford for our small plant, which requires figure juggling to show a profit—and an insignificant one at that.

"The company would use only 29 acres of the island, would pay taxes on the property, and leave the city 20 acres for wharves, docks and terminals. Moreover, the site of the present plant, which now pays no taxes and which is valued at $250,000, would be turned back to the city for other purposes. Let's get deep water without spending money."

Georgia Railway to Merge?

Atlanta Believes that Company Will Be United with Southeastern Power Group

IN SPITE of repeated denials on the part of Thomas W. Martin of Birmingham, president of the Southeastern Power & Light Company, and Harry M. Atkinson of Atlanta, chairman of the board of directors of the Georgia Railway & Power Company, that a merger of these two companies has been effected, it is reported from Atlanta that electric circles there are inclined to give credence to reports that such a merger will be arranged in the near future.

Reports at Atlanta indicate that the holdings of the United Gas Improvement Company in the Georgia Railway & Power Company have been, or soon will be, transferred to the Southeastern Power & Light Company, giving that concern virtual control. An effort will then be made, it is reported, to consolidate the two companies in the merger through an exchange of stock on a five-for-one basis, stockholders of the Georgia Railway & Power Company receiving five shares of stock in the new company for one share of stock in their own company.

Engineers' License Bill for District of Columbia

A bill providing for the licensing of engineers in the District of Columbia, drafted by the Commissioners of the District, has been approved in principle by the Citizens' Advisory Committee. The measure proposes the creation of a board of five engineers to pass upon the qualifications of those who apply for license.

One member of the committee characterized the bill as "vicious class legislation," declaring that during long residence in Washington he has known of no fraud involving an engineer. "The public does not have to be protected against them. I object to placing them on the same plane with plumbers," he declared. Despite the vigorous objections of this member, the principle of the legislation was approved, but exception was taken to a provision giving the board control of the funds which would accrue from license fees. The idea is that they should be covered into the Treasury and the board's expenses be provided by appropriations.

Edgar Station on Basis of 1 Lb. per Kilowatt-Hour

The new Edgar station of the Edison Electric Illuminating Company of Boston is now operating on a coal rate of practically 1 lb. per kilowatt-hour, the B.t.u. per kilowatt-hour in a recent run of one month being 14,350. The plant is but partly completed, and the greater part of its load has thus far been carried by one 30,000-kw. normal-pressure turbo-generating unit, the L Street station in South Boston supplying the bulk of the system's output. The 1,200-lb. boiler and turbine are now in part-time operation, although the maximum pressure has not yet been applied to the turbine installation. The so-called normal steam pressure at the Edgar station is 350 lb. It is anticipated from the results already obtained that the high-pressure unit in regular service will enable the station to produce a kilowatt-hour for 0.95 lb. of high-grade bituminous coal. The initial high-pressure installation is not a full development of the high-pressure possibilities in the Edgar station, and the company expects that a full development of this equipment will bring the generating record of the plant down to 1 kw.-hr. for 0.9 lb. of coal.

Applications to Federal Power Commission

Applications for licenses on the Osage River and on the Kentucky River will be considered at a meeting of the Federal Power Commission to be held before Jan. 15.

The Tennessee River applications, which were considered at the recent public hearing in Chattanooga, will not be ready for presentation to the commission at this meeting, but will probably be ready for action by the middle of February.

The Empire District Electric Company has applied to the Federal Power Commission for a license covering its Table Rock project in the White River on the Arkansas-Missouri border. The company asserts that it has complied with the terms of its preliminary permit. The dam, which is 6½ miles above Branson, Mo., is to be 197 ft. high and 1,924 ft. long at the crest. The gravity section will be of concrete. The pool which will be created will extend 65 miles upstream and will have an area of 29,000 acres. The usable storage amounts to 1,030,000 acre-ft. Equipment sufficient to generate 200,000 hp. will be installed. The power is intended for public utility use.

Switchboard at Muscle Shoals Put Into Service

The main switchboard at Muscle Shoals was put into service on Dec. 28. This will permit the simultaneous operation under load of the four generators which have been installed. With the switchboard in service it is expected that the line capacity away from Muscle Shoals will be occupied almost entirely by hydro power, although the steam plant will have to be kept in readiness to take over the load at any time during the testing period. While the capacity of the transmission line—85,000 kw.—is insufficient to take the maximum output of the four generators, there will be no occasion to operate all of them at capacity at the same time. The transformers now being used at Muscle Shoals are the property of the Alabama Power Company. It is General Taylor's intention to replace these with government-owned transformers as soon as possible.

If the four generators now in commission were operated so as to produce the maximum amount of power which can be taken away from Muscle Shoals, the government could realize $4,000 daily for the sale of the power. Instead of the informal arrangement now existing whereby the government receives only 2 cents a kilowatt-hour for

its power, it has been suggested that a better way would be to make a five-year contract. With assurance that deliveries of power would be continuous, a much better price would be obtainable. Next spring the additional output of the other four generators would be available. This would make available many millions of dollars annually which could be expended in experimentation with nitrogen processes.

Purchases and Mergers

Transfers of Light and Power Plants Continue in the North, South East and West

APPLICATION has been made to the New York Public Service Commission for consent to the transfer of the Rensselaer Falls Electric Light & Power Company to the St. Lawrence County Utilities, Inc. The petition states that the price to be paid is $45,000.

The New York Public Service Commission has approved the sale of the Gregory Electric Company of Morristown to the St. Lawrence County Utilities for $70,670 and authorized the Central Hudson Gas & Electric Company of Poughkeepsie to acquire the outstanding capital stock of the Citizens' Railroad, Light & Power Company and Southern Dutchess Gas & Electric Company of Beacon and the Fishkill Electric Railway Company and to merge the Southern Dutchess and Citizens' companies with the Central Hudson.

Florida utility properties controlled by the American Power & Light Company will, it is believed, soon be merged. Companies concerned are the Southern Utilities Company, Daytona Public Service Company, Miami Electric Light & Power Company, Miami Beach Electric Company and the Florida Power & Light Company, whose name will be the one retained.

On Dec. 29 the City Council of Chardon, Ohio, sold to the Cleveland Electric Illuminating Company the Chardon municipal light plant for the consideration of $44,400. The Chardon plant has about 600 customers. It is possible that the old equipment will be junked.

During 1925 several other municipal plants in Ohio were sold to privately conducted companies. Among these were the municipal plant at Salineville, which was sold to the Ohio Power Company; the municipal plant at Oxford, which was sold to the Union Gas & Electric Company, and the municipal plant at Mount Sterling, which was sold to the Columbus Railway, Power & Light Company.

One of the largest of the remaining municipal plants in that state will probably be sold to private interests on Jan. 25. This is the municipal plant at Conneaut. The City Council has advertised for bids for the plant, and it is expected that the bid price will be about $400,000. The Council has passed an ordinance fixing the maximum rate at 5 cents.

Negotiations previously indicated have been closed in Kansas City by which the North American Light & Power Company, the so-called Studebaker-McKinley interests, acquires control of the West Missouri Power Company. The latter serves fifty or more communities in western and southern Missouri and the former about ninety in Kansas, Missouri, Illinois, Iowa and Ohio. Among the North American Light & Power properties are the Missouri Power & Light Company, the offices of which recently were moved to Kansas City; the Kansas Power & Light Company, which operates many plants, including those in Topeka and Atchison; the Illinois Power & Light Company and the Iowa Power & Light Company.

The Middle Yuba Hydro-Electric Company, operating a small distribution system serving for the most part mines in the vicinity of Alleghany and Pike City, Cal., has been purchased by the Pacific Gas & Electric Company for $65,000, according to announcement by the latter company.

A dispatch from Columbia, Ky., says that a twenty-year electric franchise in that city has been sold to an investor in Springfield, Ky., who has also purchased the plant of the Columbia Lighting Company.

Three municipal electric light plants and two municipal distributing systems in central Illinois have been sold to larger power companies. The city-owned light plants of Sibley, Bellflower and Fisher have been taken over by the Central Illinois Public Service Company, and the nearby towns of Mahomet and Mansfield, which have been purchasing power from the Illinois Power & Light Company, will henceforth be served entirely by this company.

Purchase by the Texas Public Utilities Company of the electric light and power plant at Sulphur Springs from Ashcroft & Sons is announced by C. E. Calder, president of the former company.

The Georgia Railway & Power Company has purchased the municipal distribution system in the town of Douglasville, Ga., and on Jan. 1 took over its operation. The present steam plant will be operated until the lines of the power company can be extended to the town.

Cleveland Electric Illuminating Reduces Rates

A reduction in rates which will mean an annual saving of at least $600,000 to the customers affected was announced on Jan. 1 by the Cleveland Electric Illuminating Company. Commercial and residential consumers using in excess of 500 kw.-hr. will be billed at the rate of 5 cents for the first 500 kw.-hr. and 2.8 cents for all in excess of that amount. The rate has been 5 cents flat. More than 2,700 customers will benefit by this reduction. Certain other reductions have been made in rates applying to large commercial and industrial users, of whom about 2,000 will be affected.

This is the second voluntary reduction in rates made by the Cleveland company within the last two years. The previous reduction was made in April, 1924, and is estimated to have saved customers $900,000 a year.

In announcing the rate reductions President Robert Lindsay pointed out that they are in line with the company's policy of passing on to consumers the benefits of efficiencies and economies which have been developed. "Distribution and service costs," said Mr. Lindsay, "have remained virtually the same for several years, but economies have been effected in generation."

Lower Colorado Basin States Confer in Secret

Striving to come to some agreement in the matter of the development of the Colorado River, representatives of California, Arizona and Nevada conferred in Los Angeles behind closed doors from Dec. 28 to Dec. 31. Each state had one representative present. This preliminary meeting was called in the hope that a tentative agreement could be arrived at which could be presented to a conference of the full membership of the commissions of the three states to be called within the next ten days. While the actual results of the conference were not made public, the following statement, issued by George P. Squires, representing Nevada, strikes an optimistic note: "The discussion was entirely friendly, the spirit manifest was excellent, and we have made some advance in the direction of clearing up what seem to be conflicting attitudes.

California-Arizona Dispute

Wide Differences in Their Respective Allocations of Waters of the Lower Colorado

CALIFORNIA'S efforts to bring about an agreement as to the distribution among the lower states of the Colorado River basin of the 7,500,000 acre-ft. of water which passes Lee's Ferry have, as previously reported, revealed wide differences of opinion, between California and Nevada on the one hand and Arizona on the other, as to the allocation. The exact figures arrived at by the opposing sides show a variation of 1,500,000 acre-ft. in the amount apportioned to Arizona.

California wants recognition of 2,146,000 acre-ft. of perfected rights and of a diversion of 1,095,000 acre-ft. for use by Los Angeles. California would allocate 300,000 acre-ft. to Nevada and 500,000 acre-ft. to Mexico. When all her proposed allotments are added together a total of 4,273,000 acre-ft. is obtained. This would leave undistributed 3,227,000 acre-ft. of the total passing Lee's Ferry. This amount California would divide equally between herself and Arizona. In all Arizona would receive 1,845,500 acre-ft. and California 4,854,500 acre-ft.

The Arizona committee figures differently. Under its plan California would receive but 3,350,000 acre-ft. Arizona agrees to the 300,000 acre-ft. for Nevada and the 500,000 acre-ft. for Mexico, which, when deducted from 7,500,000, leaves 6,700,000 acre-ft. This the committee proposes to divide equally between the two states, or 3,350,000 acre-ft. each. In addition, Arizona reserves to herself the waters of her own rivers, which add 2,563,000 acre-ft. to the Colorado river total. A considerable part of this latter total cannot be utilized, owing to the wide variation in the discharge of the Arizona rivers.

Budgets for the Coming Year in Oregon

The Portland Electric Power Company, operating nine hydro-electric and steam generating plants, as well as street-car lines in Portland and interurban railways, has adopted a budget for 1926 amounting to $3,200,000 for improvements, betterments and extensions. Of this amount $2,400,000 will be assigned to construction and improvements in the transmission and distribution systems of the light and power department.

The Mountain States Power Company of Albany, Ore., which operates extensively through the Willamette Valley and southwestern Oregon, will spend over $560,000 for adding to its present facilities in the light and power field. Several of the other utility companies of the state are known to have under consideration individual budgets running into several millions more. It is therefore probable that the public utility companies of the state will put new capital to work in Oregon this coming year to the extent of between $7,000,000 and $8,000,000.

The Terminable Permit and Rural Development

Speaking as a witness before the Illinois commission appointed to investigate terminable permits for utility companies, when it met recently at Madison, Wis., Grover C. Neff, general manager of the Wisconsin Power & Light Company, pointed out that in Wisconsin, in which there is a terminal-permit law, 7,429 farms enjoy electric service as against 2,201 in Illinois.

"I think the farmer is more interested in the terminable permit than the city man," replied Mr. Neff. "I do not believe that Illinois is ever going to get general rural electrification unless it adopts this law, because there are so many burdens and hazards connected with the old fixed-term franchise that prohibit utility companies from extending their lines into rural territory. Probably a few farmers along the edge of cities of considerable size will get service anyway. Under existing conditions those further out will not."

Sandstone Rapids (Wis.) Plant Nearly Ready

The Sandstone Rapids hydro-electric plant of the Wisconsin Public Service Corporation, rated at 5,000 hp., is nearing completion and will probably be placed in service in January. Tests of machinery and equipment are now in progress. This plant will use the waters of the Peshtigo River for the sixth time. Plants are already in service at High Falls, Johnson Falls, Potato Rapids, Cauldron Falls and Peshtigo. The new plant is 8 miles below the High Falls plant and utilizes a head of 45 ft. The total fall used by all the plants on the Peshtigo River is more than 300 ft.

High Falls, the oldest of the power developments on the Peshtigo, is the master station for this group of plants, the other plants being operated automatically therefrom. The automatic control not only takes care of electrical operation but also handles the flow of water through the system.

Broad River (S. C.) Dams

Secretary Davis Says Power Company May Gain Possession of Two with No Federal Authorization

WHEN Senator Smith of South Carolina secured the approval of the Senate for a resolution asking the Secretary of War "if the Broad River Power Company of Columbia, S. C., has the legal right to build a dam or dams across the Broad or the Congaree River," he apparently acted on misinformation. The Secretary of War in his reply points out that the Broad River Power Company has no ownership in Broad River and that there are no power dams in the Congaree River. In regard to the seven dams in Broad River Secretary Davis says:

"The Columbia City dam is understood to have been built about 1888 and the Cherokee Falls dam about 1882 under authority of state law. Such authority was sufficient at the time of their construction, as the federal government did not assume general jurisdiction over dams in navigable waters until the enactment by Congress of Section 7 of the river and harbor act of Sept. 19, 1890."

The other five dams were built subsequent to 1890 without the federal authorization prescribed by law. They are: Ninety-nine Islands dam, Great Falls Power Company; Lockhart Shoals dam, Lockhart Power Company; Neale Shoals dam, Union Manufacturing & Power Company; Parr Shoals dam, Columbia Railway, Gas & Electric Company; Gaston Shoals dam, South Carolina Light, Power & Railway Company.

Secretary Davis points out, however, that "while the Broad River Power Company has no present ownership in the dams on the Broad River, it is understood that a possibility of future ownership exists by virtue of an act of the State of South Carolina, approved March 19, 1925, authorizing the sale to that company of the properties, charters and other rights of the Columbia Gas Light Company, the South Carolina Power Company, the Parr Shoals Company, the Columbia Railway, Gas & Electric Company, the Saluda Manufacturing Company, the Central Carolina Power Company and the Public Service Company of South Carolina. So far as known the consolidation has not yet been effected. When it takes place, the Broad River Power Company will be in possession of at least two dams on the Broad River not authorized by the federal government, namely, the one at Parr Shoals, near Peak, 27 miles above Columbia, and the Columbia City dam, 3 miles above Columbia.

"Referring to the instructions in the resolution to see that additional projects contemplated fully comply with the act of Congress," Secretary Davis adds, "it may be said that such projects will be subject to the provisions of the federal water-power act."

Pit River Development Plans Are Revised

Plans for the further development of Pit River in northern California by the Pacific Gas & Electric Company have been revised to include three plants below Pit 3 instead of two as originally planned. Pit 4 will have a head of 377 ft. created by a 24,000-ft. tunnel, Pit 5 will have a head of 595 ft. with a 30,000-ft. tunnel, and Pit 6 will operate under a head of 190 ft. produced by a dam.

As originally planned, two plants, designated as Pit 4 and Pit 5, were to have been built below Pit 3. Pit 5 would have required a 7-mile tunnel to develop a head of 980 ft. Under the new plans more favorable dam sites and power-house sites are obtained for Pit 4 and Pit 5 and the length of the Pit 5 tunnel is shortened 1½ miles. Additional water will become available for generation of power through Pit 6 from several streams which enter the Pit below the Pit 5 diversion. The head of 590 ft. on Pit 5 will permit the use of the most efficient type of reaction turbines, whereas the head of 980 ft. as originally proposed would have necessitated the use of impulse wheels. The new arrangement will furthermore permit development of the Pit River in blocks more nearly suited to meet the growth of load on the company's system. Ultimate development of the Pit River by the Pacific Gas & Electric Company calls for 600,000 hp.

Cleveland Central Station Near Billion Kilowatt-Hour Mark

With a record of 988,000,000 kw.-hr. generated in 1925, an increase of 14 per cent over the preceding year, the Cleveland Electric Illuminating Company announced that it met without stress or strain on Dec. 17 the highest peak load in its history, 336,963 hp. This exceeded by more than 32,000 hp. the record peak load of 1924.

By midsummer the first installation of the company's new power plant at Avon, on Lake Erie, 23 miles west of Public Square, will go into operation, adding 90,000 hp. to its generating facilities. Eventually this plant will have 400,000 hp. capacity. Already Avon has been connected with the Lake Shore station at East 70th Street and Lake Erie by a 132,000-volt transmission line built on the company's own right-of-way. This line, 38 miles long, provides Greater Cleveland with a belt of power and in effect opens a new industrial area.

Plans for 1926, the company says, contemplate the expenditure of $10,000,000 for further increasing facilities.

Holyoke Company Deprecates Tax on Development

The Holyoke Water Power Company, Holyoke, Mass., has outlined its proposed extensions relative to power development on the east side of the Connecticut River. It plans to install four 12,000-hp. units and to construct a tailrace from the present dam to the county bridge. In outlining its plans

the company expresses its conviction that the taxes levied should not exceed the taxes on other power properties in the state. It contends that the board of assessors in Holyoke in taxing for enhancement of values is really penalizing development. The company's statement in part follows:

"The location of four hydro-electric units [across the river from Holyoke] of 12,000 hp. is allowed without diminishing the river channel beyond the width of the overflow crest of the dam. The plant with its tailrace or discharge channel could be constructed by the Holyoke Water Power Company without purchase of real estate or interference with any industrial properties. While there are some advantages in the location of such a plant on the Holyoke side of the river, there would be a serious economic disadvantage against such a project in case the present method of local taxation of hydro-electric properties at Holyoke was applied to such a development, and it is hoped, in view of the large amount of taxable property which has been created by the company in recent years, that such a hydro-electric development at Holyoke will not be taxed more severely than if constructed elsewhere in Massachusetts."

Sixty-Million-Dollar Budget of Southern California Edison

More than $60,000,000 is to be paid out by the Southern California Edison Company during the coming year, according to a statement by R. H. Ballard, executive vice-president and general manager. Of this sum, $35,658,000 is to cover new construction. It is pointed out by Mr. Ballard that of the $60,000,000 which the company will handle less than $2,000,000 will remain available for addition to the accumulated surplus at the end of the year. For the coming year the budget, as outlined by F. D. Lewis, provides for the addition of 150,000 kw. in generating capacity—100,000 kw. from power house 2A on the Big Creek-San Joaquin project and 50,000 kw. at the Long Beach steam plant. Present plans call for the signing up of 200,000 hp. of new business. The construction of 110 miles of 60-kv. transmission lines and 420 miles of telephone lines is included in the budget. The largest single item in the construction budget is the third 220-kv. line to Big Creek. This line, which is to be known as the Vincent line, is to be in operation between Los Angeles and Magunden on Jan. 1, 1927, and the complete line to Big Creek is to be ready for use March 1, 1928.

Seattle's Municipal Projects Affected by New Bill

Passage of the Trunkey bill, now before the State Legislature of Washington, in session at Olympia, is foreshadowed by the action of the House, which, by a vote of 44 to 27, defeated an amendment which would have exempted city light and power plants from the general provisions of the bill. The bill provides that any utility bond issue for a municipally owned utility must, in addition to all other requirements, be submitted to a vote of the people if the bonds are to provide for a new unit. The bill would compel the city of Seattle to hold new elections before issuing bonds for additional units of the Skagit power project.

Mayor Brown of Seattle has signed an ordinance authorizing the city engineer and the superintendent of the Light Department to apply to the United States Department of Agriculture for a permit for additional development of electrical power on the Skagit River. A permit asked by the city already is before the department for development at Ruby Creek. Since this application was made, however, the Skagit engineering commission has recommended that a dam and power plant be built at Diablo Canyon. The measure signed by the Mayor extends the application to include development at the canyon.

Briefer News

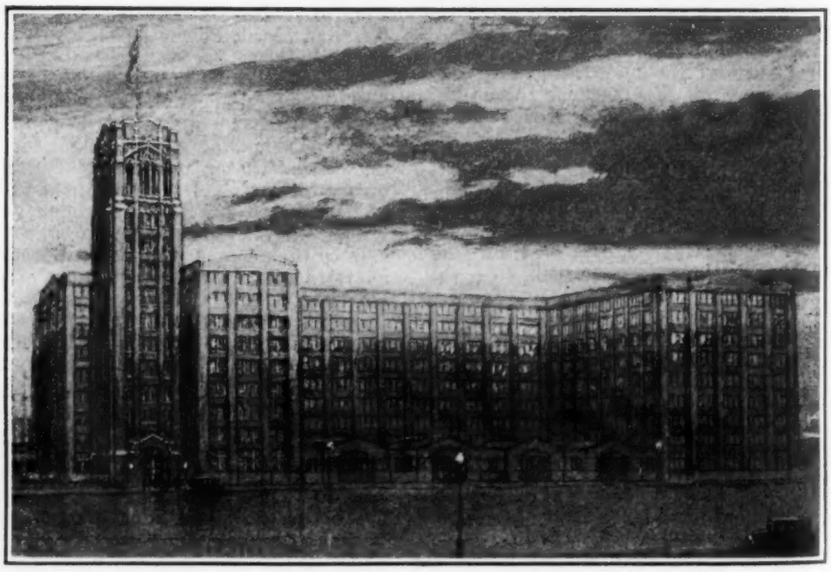
Private Plant and Municipal Plant Co-operate in Christmas-Tree Lighting.—Co-operation between the Municipal Light and Power Department of Pasadena and the Southern California Edison Company made it possible to light a mile-long street of deodars and turn Santa Rosa Avenue into two parallel rows of colorfully lighted Christmas trees. The municipal department hung 4,000 lamps on the trees and the Edison company furnished the energy. The lights were turned on from 5:30 to 10 o'clock every evening from Dec. 24 to Jan. 1 inclusive. This was the fifth time that the custom had been followed.

Tenney Interests Negotiate Important Textile Contract. — The Naumkeag Steam Cotton Company, Salem, Mass., has signed a new contract with the Salem Electric Lighting Company, a Tenney property in the North Boston lighting group, for the supply of electricity to a connected load of about 9,250 hp. in motors and 300 kw. in lighting. The contract supersedes one which expired Dec. 31.

Fifty-six Municipal Against 422 Private Plants in Missouri.—Missouri with 422 privately owned electric light and power plants and 56 municipally owned plants at the close of 1924 ranked eighth among the states in the use of electrical energy, according to J. B. Sheridan, manager of the Missouri Committee on Public Utility Information. Three hundred of the privately owned plants were units in transmission lines and 126 gave local service over 3,500 pole lines of transmission served by forty-one central stations, giving service to 300 communities with a population of 2,150,000. Local companies without transmission facilities and municipally owned plants served 250,000 others.

New York Railroads Seek More Time for City Freight Electrification.—Temporary injunctions against the enforcement of the state law passed last year which required all railroads to electrify their lines within Greater New York, Yonkers and Mount Vernon before Jan. 1, 1926, have been granted to the New York, New Haven & Hartford Railroad,

New Service Building for Commonwealth Edison



PLANS for a new service building, the first section of which is to be constructed in 1926, are announced by the Commonwealth Edison Company of Chicago. The completed building will be nine stories high, 928 ft. long and 240 ft. wide, of fireproof reinforced-concrete construction. The estimated cost of the initial section is $1,000,000. The architect's drawing is reproduced above.

This new building will house the "customer service" departments of the company, such as service and repair, lamp renewal, meter testing and stores. Special provision is made for the efficient storage and handling of material. The loading court and garage will accommodate 200 electric trucks. The building will be 25 blocks from the "Loop" district, near the company's Fisk Street and Quarry Street stations.

the New York Central Railroad, the Dry Dock Railway Company, operating in Kings County, and the Degnon Terminal Railroad Company, which operates in Queens County. The railroads assert their willingness to electrify the freight lines which are affected by the law, but maintain that it was impossible to finish the work within the time limit set.

Technical Committees, N. E. L. A., May Be Called Engineering Committees.—At a meeting of the technical committees of the North Central Geographic Division, N. E. L. A., at Minneapolis, on Dec. 14, with 43 engineers in attendance, R. F. Pack, first vice-president N. E. L. A., and C. F. Hirshfeld, chairman of the Technical National Section, spoke. Mr. Hirshfeld said that, subject to approval of the national convention, the executive committee had authorized the name of the technical committees to be changed to engineering committees.

Progress of Chimney Rock (N. C.) Hydro-Electric and Park Project.—The pleasure resort to be created at Chimney Rock, N. C., by damming Lake Lure to form a body of water covering 1,500 acres with a shore line of 27 miles, is, it is officially stated, in process of realization. Work on the dam has been in progress for several months and the foundations are laid. This dam, which is to be 104 ft. high and 585 ft. long, will, it is asserted, be completed next September. It involves a power plant which is to generate 13,500,000 kw.-hr. every year. This power is to be sold to the Blue Ridge Power Company of Spartanburg, S. C., on a ten-year contract yielding the project promoters $67,500 a year.

Heating on Proposed Holston River Dam in Tennessee.—Major Harold C. Fiske will hold a hearing at Bristol, Va., on Monday, Jan. 11, to take up the application of the Holston River Power Company for a permit to build three dams on the Holston River, one 6 miles above Kingsport, Tenn., creating a head of about 95 ft., with a proposed installation of 24,000 hp.; another just below the confluence of the South Fork and Watauga branches, creating a head of about 135 ft., with a proposed installation of 30,000 hp., and a third on the South Fork, above Bluff City, creating a head of about 130 ft., with a proposed installation of 20,000 hp. The total proposed installation is thus 74,000 hp.

Agitate Plan to Develop Power at Elephant Butte.—At a conference between officials of the Ray Consolidated Copper Company and representatives of the irrigation district served by the Elephant Butte reclamation project recently preliminary steps were taken toward the construction of a subsidiary dam and a large hydro-electric plant at Elephant Butte, where more water is impounded than is needed for irrigation. It is asserted that the plans provide for a storage dam at Las Palomas and the construction of a high-tension system to supply El Paso and other towns of the upper Rio Grande Valley as well as many of the towns and mining districts of New Mexico. Such a dam would, it is maintained, store all the water released at the big dam and not needed for irrigation. Surveys for the proposed dam and hydro-electric plant have been already made.

New Jersey's Suit Against Federal Power Commission Dismissed.—Granting a motion of the Federal Power Commission and the Attorney General, the United States Supreme Court on Monday dismissed the original bill filed by New Jersey to have the federal water-power act declared unconstitutional. The similar bill filed by New York State, with which New Jersey's bill was originally joined, was withdrawn last year.

Pictures and Figures Show Shawinigan's Prosperity.—A four-reel motion picture depicting the growth of the Shawinigan Water & Power Company was shown to newspapermen in Montreal recently. Every one of the company's plants was included. These plants, rated at more than 500,000 hp., serve 160 municipalities, covering an area of over 15,000 square miles. At the beginning of 1925 the total assets of the company were valued at $51,615,296. In 1924 the gross earnings were $5,741,079 and net earnings $2,045,899. The company has an annual payroll of $3,000,000. Pictures were shown of the plants at Shawinigan Falls, Grand' Mère, La Gabelle, Montmorency Falls, St. Féréol, St. Francis, Little Shawinigan, Chaudière and Valcartier and of many striking applications of the power.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, Jan. 2, page 80.]

Northwest Association of Electrical Inspectors—Multnomah Hotel, Portland, Ore., Jan. 11-12. F. D. Weber, 401 Lumbermen's Bldg., Portland.

American Engineering Council—Washington, D. C., Jan. 13-15. L. W. Lawrence, 29 W. 39th St., New York.

Kentucky Association of Public Utilities—Brown Hotel, Louisville, Jan. 15. E. F. Kelley, Louisville Railway Co., Louisville.

Rocky Mountain Section, N. E. L. A.—Hot Springs Hotel, Idaho Springs, Col., Jan. 25-26. O. A. Weller, Public Service Company of Colorado, Denver.

Western Association of Electrical Inspectors—Hotel Sherman, Chicago, Jan. 26-28. W. S. Boyd, 175 West Jackson Blvd., Chicago.

American Institute of Electrical Engineers—New York, Feb. 8-12. F. L. Hutchinson, 33 West 39th St., New York.

Oklahoma Utilities Association—Mayo Hotel, Tulsa, March 9-11. E. F. McKay, Suite 307, Local Bldg., Oklahoma City.

Southwestern Public Service Association—Galveston, Tex., April 13-16. E. N. Willis, 403 Slaughter Bldg., Dallas.

Southwestern Geographic Division, N. E. L. A.—Galveston, Tex., April 13-16. S. J. Ballinger, San Antonio Public Service Co., San Antonio.

National Electric Light Association—Atlantic City, N. J., May 17-21. M. H. Aylesworth, 29 West 39th St., New York.

Electric Power Club—The Homestead, Hot Springs, Va., May 24-27. S. N. Clarkson, B. F. Keith Bldg., Cleveland.

Rural Electrification in Nebraska.—As an outcome of the recent formation in Nebraska of a state committee on the relationship of electricity to agriculture, a meeting is to be held this month in that state to determine the cost of rural electrification. President J. E. Davidson of the N. E. L. A., Deans Burnett and Ferguson of the State College of Agriculture and representatives of farm organizations, including former Governor McKelvie, are expected to attend. "No funds have been made available for construction of experimental lines as in some other states," explained Prof. E. E. Brackett of the University of Nebraska, who is directing the state's interest in the work; "but this has been accounted less essential in Nebraska because the Saunders County rural electric district has afforded a convenient laboratory for observation and experiment."

Rochester Gas & Electric's New Building. — The new ten-story office building of the Rochester (N. Y.) Gas & Electric Corporation is so near completion that several of the general office departments have moved in. The building, which has cost so far $1,234,000, will be entirely finished next spring. Except for a banking house on the first floor, it will be occupied exclusively by the utility company. When finished it will be floodlighted every evening. The company spent or appropriated more than $700,000 on electrical plant additions and substations last year and will spend as much more this year for a switch house at Mill Street and Brown's Race, to be finished in the fall. Work on the dam at Caneadea (see ELECTRICAL WORLD for Dec. 12, page 1225) is slated to be begun in the spring by the Caneadea Power Company, an allied utility. It will cost about $1,000,000, as against ten times that amount for the postponed hydro-electric project at Mount Morris, and is expected to supply an initial 2,600 hp. next November.

Iowa's Seven Large Light and Power Companies. — Seven large companies control and operate 80 per cent of the electric light plants in Iowa, according to a résumé of the development of utilities in Iowa in the last decade issued recently by Joe Carmichael, head of the Iowa Committee on Public Utility Information. In 1922 a survey of all electric generating units in the state showed a combined power rating of 236,680 kw., while a survey of Nov. 12, 1925, indicated a capacity of 370,680 kw. Even greater increases in 1926 are predicted, because many stations just outside the border which have been serving the state will be replaced by new generating stations within Iowa. The seven controlling systems in Iowa now are the Des Moines Electric Light Company, the United Light & Power Company of Davenport, the Iowa Railway & Light Company of Cedar Rapids, the United Gas Improvement Company, owning plants in the Waterloo district; the Iowa Southern Utilities Company of Centerville, the Northeastern Iowa Power Company of Davenport and the Interstate Power Company of Dubuque. The state boasts that 99¼ per cent of its urban population live in places where there is electric service.

Men of the Industry

S. L. Nicholson Elected as Acting Westinghouse Vice-President

At a recent meeting of the executive committee of the Westinghouse Electric & Manufacturing Company S. L. Nicholson was elected acting vice-president. Mr. Nicholson joined the Westinghouse company in 1898, was made sales manager eleven years later and in 1917 was appointed assistant to the vice-president. Mr. Nicholson assisted in the formation of and was the first president of the American Association of Electric Motor Manufacturers, which is now known as the Electric Power Club, and he also assisted in the formation of the American Gear Manufacturers' Association, of the Stoker Manufacturers' Council, which is the co-ordinating committee of the Power Club; of the Electrical Manufacturers' Club and of the Associated Manufacturers of Electrical Supplies. In 1921 he was chairman of the tariff committee of the Council and represented the electrical industry on the National Industrial Conference Board. He is also a member of the Electrical Safety Conference, the American Statistical Association and the Bureau of Personnel Research for the Carnegie Institute of Technology. He was recently awarded the James H. McGraw medal for his work in connection with nationally standardized electrical codes. His office is in New York.

J. H. Roraback Heads Connecticut Utility

J. Henry Roraback of Hartford, Conn., has been elected president of the Connecticut Light & Power Company to succeed Lewis Lillie of Philadelphia. Mr. Roraback has been connected with the Connecticut utility for 20 years. As a lawyer, back in 1905, Mr. Roraback obtained the charter for the company, then the Rocky River Power Company. The company began business in 1917, when Mr. Roraback interested Randal Morgan of Philadelphia in the possibilities of power development in Connecticut. The Rocky River company became the Connecticut Light & Power Company, and a new charter authorized the purchase of the Housatonic Power Company, owned by the New York, New Haven & Hartford Railroad, and the United Electric Light & Water Company, which served Waterbury and New Britain. Mr. Roraback became vice-president of the company, and it is from that office that he is succeeding to the position of president.

Ketcham, Cullinan and Dunn Are Vice-Presidents of Graybar

Frank A. Ketcham, who has been appointed executive vice-president of the Graybar Electric Company, as announced in the Dec. 26 issue of the ELECTRICAL WORLD, became general sales manager of the Western Electric Company after eighteen years' service for the company beginning with a clerkship in its Chicago office. He was born at Saginaw, Mich., and started his business career with the Western Electric Company at Chicago in 1900. Five years later he held the rank of telephone storekeeper. He was advanced to the assistant managership in 1907 and in 1911 was appointed manager. A short time after he was promoted to the title and duties of central district manager. Mr. Ketcham became general sales manager of the Western Electric Company in 1918, and in 1923 he was appointed general manager of the supply department, which had been separated from the telephone department in 1921. He held this position up to the present change in corporate name from Western Electric Supply Department to Graybar Electric Company.

F. A. KETCHAM

G. E. CULLINAN

L. M. DUNN

George E. Cullinan, vice-president in charge of sales of the Graybar Electric Company, entered the statistical department of the Western Electric Company immediately after his graduation from Williams College in 1901. Mr. Cullinan held several positions at the New York distributing house of the company and was acting as chief storekeeper in 1907, when he was transferred to St. Louis. He became assistant manager at St. Louis the following year, and in 1909 was promoted to the position of manager. His next step was to the rank of Western district manager with headquarters in St. Louis, and this was followed by a transfer to Chicago as manager of the Chicago distributing house and central district manager. In January, 1923, Mr. Cullinan became general sales manager of the Western Electric Supply Department, with headquarters in New York, which position he held up to his present promotion.

Leo M. Dunn, another vice-president of the new organization, entered upon his business career in 1886 with the Central District Printing & Telegraph Company of Pittsburgh, an operating telephone concern associated with the Western Electric Company. Stepping into his first supervisory job at the age of nineteen, Mr. Dunn started on a long and conspicuous career in the supply distributing business of the Western Electric Company. He held successively a number of important positions. In 1910 he was chief storekeeper of the Pittsburgh distributing house. He became manager at Pittsburgh in 1913 and manager of the Philadelphia house in 1918. The next year he was made assistant Eastern district manager. Two years later he was transferred to New York as manager of the New York distributing house and Eastern district manager. He became general merchandise manager of the supply department in 1923, a position which he held up to his present advancement to the vice-presidency in charge of merchandising and accounting.

M. J. Bethenod of the Ecole Supérieure d'Electricité of Paris has been made the recipient of the Gaston Planté prize by the French Académie des Sciences for his work on the generation and utilization of alternating current at high frequencies.

O. D. Street, formerly general manager of distribution for the Western Electric Company, has been elected a vice-president and director of Thomas F. Logan, Inc., advertising agents. Mr. Street has been prominently identified with the electrical industry for many years and is a recognized authority on the problems which particularly concern distribution.

Albert Goldman, who has been connected with the New York Edison Company for the past twenty-five years, has been appointed Commissioner of Plant and Structures of the city of New York by Mayor James J. Walker. Mr. Goldman, who has not held public office before, has been general commercial representative of the New York Edison Company in the Bronx since 1910, as well as the general agent of the Yonkers Electric Light & Power Company. He has been prominently identified with the civic and industrial development of the Bronx as a member of numerous civic, social and fraternal organizations and recently was elected to the presidency of the Electrical League of New York.

Frank W. Funk has been appointed assistant to the general manager of the Penn-Ohio system to succeed C. I. Crippen, who recently joined Stevens & Wood, Inc., in New York. Mr. Funk is widely known throughout the Mahoning and Shenango valleys as a consulting and electrical engineer.

L. H. Rosenberg has resigned his position as manager of the sales promotion department of the Westinghouse Lamp Company to join the staff of Thomas F. Logan, Inc., at Chicago. Mr. Rosenberg has been connected with the Westinghouse companies for the past six years. He has also resigned from the industrial lighting committee of the National Electric Light Association, on which he has served since its inception. Mr. Rosenberg has been very active in promoting this work and played a prominent part in preparing the plan which is now being carried out throughout the country.

Col. Theodore H. Dillon has resigned as professor of public utility management, Harvard University, to become manager of the Boston district of the United Fruit Company. Colonel Dillon is widely known in electrical circles, having been professor of electrical engineering at the Massachusetts Institute of Technology in 1920-1924, just before his connection with Harvard. He was graduated from West Point in 1904 and had a distinguished career in military engineering before engaging in educational work. **Philip Cabot**, formerly president of the Turners Falls Power & Electric Company and at one time partner in the banking house of White, Weld & Company, Boston, has been placed in charge of the course in public utility management in the Harvard University School of Business Administration.

W. R. Sammons, for more than twenty years identified with the Knoxville Power & Light Company—a greater part of this time as commercial manager—has accepted an executive position with the Servel Corporation and will be associated with L. W. Driscoll in the Southeastern district, with offices in Atlanta. Mr. Sammons has been prominently identified with the electrical industry in the South, having been president of the Southeastern Section of the National Electric Light Association and at the present time being chairman of the Commercial Section of the Southeastern Division. Mr. Sammons will assume his new duties Feb. 1.

J. B. Woodyatt New President of Southern Canada Power

James Blain Woodyatt has been appointed president of the Southern Canada Power Company, Montreal, to succeed the late W. C. Hawkins. A native of Brantford, Ontario, Mr. Woodyatt has had wide experience in electrical engineering. Following graduation from McGill University in 1904, he was employed by the Niagara & Welland Power Company, the Toronto & Hamilton Railway and the Canadian Westinghouse Company. Subsequently, after spending a year as salesman for Allis-Chalmers-Bullock in Montreal, in 1910 he received an appointment as superintendent of power in the Sherbrooke Railway & Power Company.

When that utility and other companies in the same territory combined to form the Southern Canada Power Company in 1913, Mr. Woodyatt was made general superintendent, with headquarters in Montreal. In 1916 he became general manager, which promotion was followed by his election in 1920 to the vice-presidency and now to the presidency. He still retains his position as general manager. Besides directing the operations of the Southern Canada Power, he is managing director of the Power Corporation of Canada and serves on the board of the Ottawa & Hull Power Company, the Ottawa River Power Company, the Ottawa-Montreal Power Company and the Canada Northern Power Company, all controlled by the Power Corporation of Canada.

H. R. Austin has resigned as assistant to the president of the Los Angeles Gas & Electric Corporation after 25 years of continuous service with that utility and has retired to private life to take care of personal interests. Mr. Austin entered the employ of the Los Angeles Lighting Company, one of the predecessor companies of the present organization, as a salesman on Jan. 1, 1901. In 1910 he was made secretary to the president. Ten years later his title was changed to assistant to president, which title and position he has held to date.

W. H. Sawyer of Columbus, Ohio, and **H. W. Eales** of St. Louis, both of whom occupy prominent positions in the electrical industry, will sail for Australia Feb. 2 to make a survey of electric power resources in that country, according to an announcement made by Sir James Elder, Commissioner for Australia in the United States. These men have been summoned to Australia to place the benefit of America's electrical experience at the disposal of a country which aspires to change itself from a producer of raw materials to a self-contained nation. Mr. Sawyer, an executive engineer, holds the rank of fellow in the American Institute of Electrical Engineers and is first vice-president of the American Electric Railway Association. Mr. Eales, who goes to Australia as his assistant, is a regional vice-president in the American Institute of Electrical Engineers and is active in National Electric Light Association work. Both Mr. Sawyer and Mr. Eales are executive officers in subsidiaries of the North American Company. They are undertaking the mission to Australia on extended leaves of absence.

Obituary

Romulus R. Colgate, developer of electrical power in California, died Jan. 6 at his home in Sharon, Conn., in his sixty-seventh year. Though a native of New York, Mr. Colgate transferred his interests to the Pacific Coast some years after his graduation from Columbia University. He organized the Yuba Electric Power Company and consolidated it with the Nevada Power Company as the Bay Counties Power Company, which supplied San Francisco and neighboring cities with electricity. Subsequently Mr. Colgate organized the California Gas & Electric Company, which furnished light and heat over a large territory around San Francisco Bay. He relinquished his plans for the expansion of this company later when his health failed. At the time of his death Mr. Colgate was a director of the Federal Light & Traction Company and other industrial corporations.

O. C. Miller, underground electric engineer for the Los Angeles Gas & Electric Corporation, died suddenly Dec. 11. Mr. Miller had been connected with the Los Angeles corporation almost continuously for thirty years. He was 58 years old.

Gordon Phillip died at Niagara Falls, Ontario, Dec. 24 after an illness of six weeks caused by blood poisoning. He was born at Port Hope, Ontario, and was graduated with honors as an electrical engineer from the University of Toronto. Mr. Phillip entered the service of the Ontario Hydro-Electric Power Commission and at the time of his death was superintendent of its plant at Niagara Falls. He was 33 years of age.

William Clark, president of the South County Public Service Company, organized through the merger of the Westerly Light & Power Company, the Narragansett Pier Electric Light & Power Company and the Wickford Light & Water Company, all of Rhode Island, died Oct. 24 at St. Luke's Hospital, New York, following an illness of two years. Mr. Clark was born at Paisley, Scotland, in 1851, removing to this country when eight years of age. He served as president of the Westerly Light & Power Company since its incorporation in 1907 until it was taken over by the South County Public Service Company in May, 1925, when he was chosen president of the latter organization.

Arthur Winslow Jones, manager of the Far East department of the International General Electric Company since its formation in 1919 and a member of the advisory committee of the company, died at his home in Schenectady, N. Y., on Dec. 26. As manager of the Far East department of the International company, Mr. Jones had general direction over activities of the company in Japan, China, Australia, South Africa, India, the Philippine Islands and the Dutch East Indies.

Commission Rulings

Competition a Question of Public Policy for Commission to Determine.—As the result of refusal of service by the Juniata Public Service Company to residents of a summer colony at Aqueduct, Pa., the Penn-Perry Electric Company and the Reed Township Electric Company were formed and applied to the Public Service Commission of Pennsylvania for the right to serve territory belonging to the Juniata company, the two new companies intending to merge as the Aqueduct Electric Company for that purpose. Their application was refused by the commission, which said that it will not grant a certificate to a proposed company to begin service in a territory where another company has the right to serve unless there has been either a forfeiture or a surrender of charter rights of the existing company, or unless competition appears beneficial to the public interest and accords with public policy. Whether or not competition shall be permitted between public utilities is a question of public policy to be determined by the commission from the facts in each case, the decision said.

An "Electric" Company Cannot Absorb a "Water Power" Company When the Latter Was Chartered as a Water-Power Company Simply.—The Pennsylvania Public Service Commission has refused to grant the Metropolitan Edison Company of Reading the right to acquire by purchase the property and franchises of the York Haven Water & Power Company, which was chartered as a water-power company, on the ground that a "water-power" company is not following the same line of business as an electric company or a similar one, as was contemplated by the act of 1915, although the water-power company was engaged exclusively in the generation and sale of electricity developed by water power. The acquisition of a controlling interest in the capital stock of the York Haven Electric Transmission Company by the Metropolitan Edison Company was, however, approved. The commission said in explanation of its ruling in this case: "The history of the legislation on the subject of electric companies indicates in our opinion a public policy of keeping the two classes of corporations separate. In the legislative session of 1921 separate acts of assembly conferring the right of eminent domain were considered expedient and proper. In 1919 the Legislature authorized the merger of a street-railway company with an electric company, but confined it to the light, heat and power company to the exclusion of the so-called hydro company. The light, heat and power company is limited in its chartered territory to a single city, borough, town or township or a part thereof, styled in the act, as judicially construed, as a district. A desire for territorial enlargement must be accomplished through a 'short' or 'long' merger. A water-power company is not territorially so limited. In fact, no limitation whatever expressly appears. Obstructions to the natural flow of a stream—e.g., dams, forebay walls, etc.—are almost universally necessary to the generation of electricity from water power in Pennsylvania. Not so with respect to companies generating electrical energy from steam. It does not require any forced interpretation to infer a legislative belief that the public welfare might require restrictions on the one that should not be applied to the other, or that the extent of corporate powers to be enjoyed ought not to be coextensive in both cases."

Recent Court Decisions

Levy Made by Beatrice, Neb., for Extending Municipal Plant Illegal.—In a taxpayers' suit (Drew vs. City of Beatrice), the Supreme Court of Nebraska has decided that a levy of $40,000 made by the City Commissioners of Beatrice for extending the commercial electric lines of the city is illegal. Only that part of the tax is legal which will be raised by a levy of 1 mill. The Commissioners made a levy of 4.111 mills. The ruling of the court is based upon the action of the 1921 Legislature in reducing all tax levies fixed by previous statutes to one-fifth of what they were before, at which same time the Legislature changed the basis of taxation from one-fifth of the valuation to full valuation.

Limitation of Commission's Power Over Company Leasing Property to Public Utility.—The decision of the Supreme Court of Wisconsin, in Chippewa Power Company vs. Railroad Commission, that a company does not by leasing property to a public utility become thereby itself a public utility and cannot be directly regulated by the commission through the fixing of rent, was briefly noted in the ELECTRICAL WORLD for Dec. 12 (page 1228). On this point the court said in part: "The commission's powers are confined to those rates, tolls or charges that the public must pay for service. In fixing rates which the public must pay, the action of the commission is not precluded by the amount of the rentals which the uptility pays for the property which it leases. The rental actually charged can only form the basis for rate making where such an amount is determined as reasonable by the commission, and if such rental be exorbitant, it becomes the duty of the commission to allow for that purpose only such amount as it may deem reasonable. . . . The public is primarily and solely interested in a reasonable rate, which it is the duty of the commission to ascertain and fix. Where the rate is such that it does not permit a reasonable return upon the present fair value of the property at the time it is being used for the public, it is confiscatory from a judicial standpoint; but when the interests of the public have been fully satisfied and a reasonable rate fixed as to it, the rate nevertheless may be reasonable although it may permit the utility to earn a return beyond the legal rate of interest on the money invested. . . . It is argued that . . . an exorbitant rental may result in the bankruptcy of the utility and thus deprive the public either of service altogether or of adequate service. There is great force in this argument. A public utility in the performance of its functions has a dual aspect. The interests of the public are guarded by the commission. The interests of the stockholders are primarily represented by the officers and directors of the corporation. . . . If the amount of the rental is unreasonable and exorbitant, the principal burden rests upon the stockholders, and in order to make good on or save their holdings it would be incumbent upon them to see that their interests are properly represented, or otherwise suffer the consequences." (205 N. W. 900.)*

No Recovery for Mental Suffering—Exemplary Damages Cannot Be Awarded on Slight Foundation.—The Supreme Court of Florida reduced from $15,000 to $10,000 damages awarded in Lawler vs. St. Johns Electric Company for the death of the plaintiff's husband, who while walking on the shore at a point where he apparently had a right to be grasped a heavily charged electric wire belonging to the defendant company and formerly used for trolley service which had been allowed to remain at a height dangerous to the public. The higher court reduced the damages in part because an allegation of breakdown based on mental suffering had been allowed to go to the jury and in part because it saw in the evidence no sufficient foundation for exemplary or punitive damages. (105 So. 818.)

Colorado Utilities Commission's Power to Bar a Utility from Assigned Territory.—The Clear Creek Power & Development Company asked the Colorado Public Utilities Commission for permission to bring its transmission lines within the city of Idaho Springs for the purpose of selling electricity. The city was already served by the Public Service Company of Colorado, through the Colorado Power Company, and the permit was refused. The Clear Creek company then strung its wires to Dumont, which is classed as being in the "Idaho Springs district," and the commission asked the County Court for an injunction restraining the company from serving this place. This was refused, but the court ruled that the commission had the right to deny entrance to a new company where a city was already served. The Colorado Power Company had previously declined to serve Dumont. The Colorado Supreme Court has now sustained the rulings of the lower court. It grants that the commission has jurisdiction to issue blanket orders restricting the activities of a utility in a given territory, but when it went outside of the corporate limits of the city of Idaho Springs, especially when it should have been known that the servitors of the Springs refused to go outside and serve Dumont, then the commission exceeded its authority.

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Financial and Corporate

Utility Market Improves

Stocks Rally Following Holidays as the General List Advances—Leaders in Trading

THE return of somewhat cheaper money earlier in the week gave the post-holiday markets fresh impetus, and prices on the New York Stock Exchange improved generally in a wide list of issues. The flow of January reinvestment funds to the market has not yet become so large as it will be soon, but buying of stocks now is partly in anticipation of the huge volume of funds seeking reinvestment at this season.

Strength and pronounced activity in the shares of the Southeastern Power & Light Company still is the feature of trading on the New York curb market, where on Monday, for example, the price rose three points to a new high in the history of the company at 45. A price of 45 for the present Southeastern shares is the equivalent of 225 for the stock that was split on a five-to-one basis not long ago and of 450 for the old Alabama Traction, Light & Power stock subsequently split on a two-to-one basis into Southeastern.

A smart upturn in Electric Bond & Share stock to a new recent high at 86 occurred early in the week, and, to mention another issue in the Bond & Share family, National Power & Light continued active and strong. Commonwealth Power shares, which had been quiet for some time, suddenly have turned higher.

New Capital Issues

First mortgage 6 per cent sinking-fund gold bonds to the amount of $5,250,000 were offered during the past week by the Northern Ontario Light & Power Company, Ltd., at 100 and accrued interest. The proceeds from the sale of this issue will provide funds for the redemption of the company's issue of $5,006,500 first mortgage sinking-fund 6 per cent gold bonds. The Pennsylvania Gas & Electric Company floated a new issue of fifteen-year 6 per cent sinking-fund debentures, series A, to the amount of $1,000,000. These debentures were offered at 95½ and accrued interest, to yield about 6½ per cent. The Staten Island Edison Corporation issued 35,000 shares of six-dollar dividend series first preferred stock, the price being 94½ and accrued dividends, to yield about 6.35 per cent.

An additional issue of first lien and refunding mortgage 5½ per cent gold bonds, totaling $3,938,000, was offered by the Wisconsin Public Service Corporation at 99 and interest, yielding over 5.55, and a short-term offering of 5 per cent gold notes, totaling $2,500,000 was made by the Columbus Electric & Power Company.

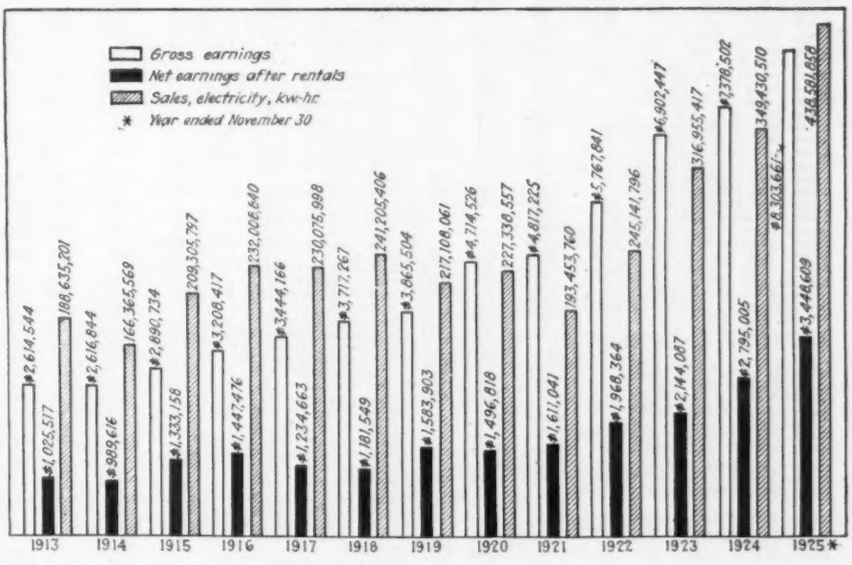
Rome Wire Stockholders Vote Increase in Capitalization.—At a meeting of stockholders of the Rome Wire Company held on Dec. 15 an increase in the 7 per cent preferred stock from $4,000,000 to $10,000,000 was authorized. The plan proposed also involved the dividing of the common stock into two classes, A and B. Class A stock will have a cumulative preference dividend of $3 per share, plus dividends equal in dollars per share to the dividends paid on the class B stock in any year in excess of $3 per annum. It will have no voting power except in special cases. Class B stock, having full voting power, will be entitled to such dividends as declared by the directors after $3 per share has been declared on class A stock. Both classes will share equally in any extra dividend. One share of class A stock and three shares of class B stock are to be exchanged for each present share of common stock.

Mohawk Merger Benefits Adirondack

Adirondack Power & Light Company Now a Key System in Large Group of Interconnected Properties in New York and New England

By PAUL WILLARD GARRETT
Financial Editor *New York Evening Post*

FLOTATION of a five-million-dollar issue of first and refunding mortgage 5 per cent bonds within the last fortnight by the Adirondack Power & Light Corporation on a 5.25 per cent yield basis calls attention to the greatly improved position of this growing utility. The Adirondack Power & Light Corporation itself was formed in 1920, through the consolidation of the Municipal Gas Company of the city of Albany, the Cohoes Power & Light Corporation, and in addition gave it interests in neighboring situations. Furthermore, certain arrangements were made for co-operative efforts with the Power Corporation of New York that should benefit the Adirondack properties. For a long period the Adirondack Power & Light Corporation



GROSS EARNINGS OF ADIRONDACK POWER & LIGHT CORPORATION SHOW STEADY GROWTH

Adirondack Electric Power Corporation and the Mohawk Edison Company, Inc., and it has given promise of big things ever since that consolidation, but the 1925 merger with other utilities is what now opens the way for a still broader development.

This new plan, it will be recalled, gave the Mohawk Hudson Power Corporation control of the Adirondack Power & Light Corporation, the Utica Gas & Electric Company, the Fulton County Gas & Electric Company, the properties were not highly productive revenue sources for the reason that the system was too greatly dependent upon rainfall. Provisions for enlarged steam facilities and interconnection with other properties have changed the situation entirely, but, of course, the system is only now getting to the point at which the improved position may be expected to be reflected in larger earnings.

While the benefits of these more recent mergers have not been reflected as yet in the earning statements of the

Adirondack Power & Light Corporation to any great degree, the record of the corporation's growth over the last decade or more is an impressive one. As revealed in the accompanying chart, gross earnings by steady yearly gains have climbed from $2,614,544 in 1913 to $8,303,661 for the twelve months ended Nov. 30, 1925, and net earnings after rentals in the same period grew from $1,025,517 to $3,448,609.

Upon completion of the present financing Adirondack Power & Light will have outstanding $28,846,000 in mortgage bonds, $5,394,100 in debentures and $21,508,200 in capital stock. From the gross earnings of $8,303,661 for the twelve months ended Nov. 30, 1925, was expended $4,855,052 for operating expenses, maintenance, taxes and rentals, leaving net earnings of $3,448,609. This sum is sufficient to cover more than twice annual interest requirements on all mortgage bonds presently to be outstanding.

Capital Increase.—The Western New York Utilities, Inc., has filed a certificate at Albany, N. Y., increasing its authorized preferred stock from $1,500,000 to $2,000,000. The common stock remains unchanged.

Dividends Declared

The quarterly dividends listed below have been announced by electric light and power companies and electrical manufacturing companies:

Name of Company	Per Cent	When Payable
Abitibi Power & Paper, com	$1	Jan. 20
Canada Northern Power, Ltd., pf	1¾	Jan. 15
Central Indiana Power, 6% pf	1½	Jan. 1
Central Power & Light, pf	$1.75	Feb. 1
Commonwealth Power, pf	$1.50	Feb. 1
Commonwealth Power, com	.40	Feb. 1
Edison Electric Illg., Boston	3	Feb. 1
International Utilities, cl. A	.87½	Jan. 15
International Utilities, pf	$1.75	Feb. 1
Jeffery-Dewitt Insulator and the Champion Switch, 7% pf		Jan. 1
New Orleans Public Service, Inc., pf.	$1.75	Jan. 2
Ohio Brass, cl. B	$1	Jan. 15
Ohio Brass, pf	1½	Jan. 15
Ottawa-Montreal Power, pf	1¾	Jan. 15
Power Corp. of Canada, pf	1½	Jan. 15
San Diego Consol. Gas & Elec., pf	1¾	Jan. 15
Southern Indiana Gas & Elec., 6% pf	$1.50	Jan. 2
So. Indiana Gas & Elec., 6% pf.*	$3.00	Jan. 2
So. Indiana Gas & Elec., 7% pf	$1.75	Jan. 2
Southern Wisconsin Elec., cum. pf	1¾	Jan. 15
Southern Wisconsin Elec., com. cap.	2	Jan. 26
Southern Wisconsin Elec., com. cap.†	4	Jan. 26

* Semi-annual. † Extra.

Hurley Machine Capital Readjustment Approved

Stockholders of the Hurley Machine Company on Dec. 28 voted approval of the proposed changes in name and stock increase outlined in the Dec. 19 issue of the ELECTRICAL WORLD. The name of the company will be changed to Electric Household Utilities Corporation, and the authorized capital will be increased from 300,000 shares of no par value to 600,000 shares with a par value of $10. The exchange basis will be one share of Hurley stock for two shares of Electric Household stock. As announced previously in the ELECTRICAL WORLD, S. D. Heed was elected president and a director, Neil C. Hurley chairman of the board and Edward N. Hurley chairman of the executive committee, which consists of Edward N. Hurley, Neil C. Hurley, Samuel M. Fulton, Edward F. Carry and Bernard E. Sunny. The members of the board of directors are, in addition to those serving on the executive committee, Joseph E. Otis, Silas H. Strawn, Alva J. Fisher, N. R. Birge and S. D. Heed.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Thursday, Dec. 31	Low 1925	High 1925
STOCKS			
Abitibi Pwr. & Paper, com.—no par	f 73¼	62	76¼
Adirondack Pwr. & Lt.—7% pf.	102	98	106
Adirondack Pwr. & Lt.—8% pf.	107	103	115
Adirondack Pwr. & Lt., com.—50.	k 75	31	98
Ala. Pwr., pf.	102	c7½	106
Allis-Chalmers Mfg. pf.	f109½	103½	109
Allis-Chalmers Mfg., com.	f 92½	71½	97½
Amer. & Foreign Pwr., pf. 25% pd.	k135	114¼	142
Amer. & Foreign Pwr., 7% pf.—no par	f92	87	94
Amer. & Foreign Pwr., com.—no par	f 41½	27½	51¼
Amer Bosch Magneto, com.—no par	f 33	26½	54½
Amer. Brown, Boveri, pfc., stk.	f 48	47½	53¾
Amer Elec. Pwr., pf.	c 101¾	91	104½
Amer. Gas & Elec., 6% pf.—no par.	91½	85	93
Amer. Gas & Elec., com.—no par.	77	70	85
Amer. Lt. & Trac., 6% pf.	114	93	119½
Amer. Lt. & Trac., com.	235	139	288
Amer. Pwr. & Lt., 6% pf.	95½	84	95
Amer. Pwr. & Lt., com.—no par.	66	52	67¼
Amer. Pub. Serv., 7% pf.	96½	88	96
Amer. Pub. Serv., com.	47	45	90
Amer. Pub. Utilities, 4% pf.	79	....	....
Amer. Pub. Utilities, 6% pf.	79	71	82
Amer. Pub. Utilities, 7% pf.	87	87	95
Amer. Pub. Utilities, com.	79	70	103
Amer. Superpwr., pf.—25	f25½	....	....
Amer. Superpwr., Class A—no par.	f35	....	....
Amer. Superpwr., Class B—no par.	f 37½	....	....
Amer. Wtr. Wks. & Elec., 7% pf.	101½	97½	103
Amer. Wtr. Wks. & Elec., com.	f 73½	34½	76½
Appalachian Pwr., 7% pf.	99	92	100
Appalachian Pwr., 1st pf., 7%	100	95	101
Appalachian Pwr., com.—no par	78	70	83
Arizona Pwr., 7% pf.	83	75	87
Arizona Pwr., com.	28	15	34½
Arkansas Cent. Pwr., pf., $7—no par	101	97	102
Arkansas Lt. & Pwr., 7% pf.	96½	92	102
Arkansas Lt. & Pwr., com.	100	65	101
Asheville Pwr. & Lt., 7% pf.	j101	f100½	f102
Assoc. Gas & Elec., 7% pf.—1% extra—50	f 50	....	....
Assoc. Gas & Elec., pf.—$6—no par	f 82	....	....
Assoc. Gas & Elec., Class A	f 35	....	....
Babcock & Wilcox, com.	f142	....	....
Birmingham Elec. pf.—$7—no par.	101	98	103
Blackstone Valley Gas & Elec., com.—50	95	....	....
Blaw-Knox, com.	k 59	....	....
Brazilian Trac., Lt. & Pwr., com.	j 83½	....	....
Broad River Pwr., pf.	93	90	97
Brooklyn Edison, com.	f134½	120½	156½
Buffalo Gen. Elec., com.—no par.	k 58	50	77
Buffalo, Niagara & East. Pwr., pf.—25.	f 24½	....	....
Buffalo, Niagara & Eastern Pwr., com.—no par	f 36½	....	....
Carolina Pwr. & Lt., pf.—$7—no par	104½	100	107
Carolina Pwr. & Lt., com.	420	290	456½
Central & S. W. Utilities, 7% pf.—no par	a 89½	88	90½
Central & S. W. Utilities, pr. In. pf.—no par	a 98½	96½	100
Central Ariz. Lt. & Pwr., pf.	101	100	106
Central Ark. Ry. & Lt., 7% pf.	96	91	98½
Central Ill. Pub. Serv., 6% pf.	87	84	93
Central Ind. Pwr., 7% pf.	88	88	95
Central Pwr. & Lt., pf.	95	88	96½
Central States Elec., 7% pf.	93	87	98
Central States Elec., com.	210	70	250
Century Elec. com.	k103	103	110
Chicago Fuse Mfg., com., no par	a 33	27½	39½
Cincinnati Gas & Elec., com.	g 89½	82	90
Cities Service, 6% pf.	84	80	84
Cities Service, pf. B—10	f 7½	....	....
Cities Service, pf. BB—100	f 77	....	....
Cities Service, com.—20	38	34	43
Cities Service, Bks. Shrs.—10	17½	16½	22
Cleveland Elec. Illg., 6% pf.	102	101	105
Cleveland Elec. Illg., com.	240	200	250
Colorado Pwr., 7% pf.	96	93	98
Columbia Gas & Elec., 7% pf.	114½	104½	114½
Columbia Gas & Elec., com.—no par	f85½	45½	86
Columbia Ry., Gas & Elec., 6% pf.	90	90	90
Columbus Elec. & Pwr., 2d pf.	f100	....	....
Columbus Elec. & Pwr., com.	f148	....	....
Columbus Ry., Pwr. & Lt., pf. A	98	86	99
Columbus Ry., Pwr. & Lt., pf. B	92	80	85
Columbus Ry., Pwr., & Lt., com—no par	82	70	85
Commonwealth Edison, com.	a138	130½	141¼
Commonwealth Pwr., 6% pf.	86	80	88
Commonwealth Pwr., com—no par.	38½	30½	43¾
Conn. Lt. & Pwr., 8% pf.	118	115	118
Conn. Lt. & Pwr., 7% pf.	110	105	110
Cons. Gas of N. Y., pf.—50	56	60½	100
Cons. Gas of N. Y., com—no par	f94½	74½	97
Cons. Gas Elec. Lt. & Pwr. of Balti., 6% pf.	c103	102	105
Cons. Gas, Elec. Lt. & Pwr. of Balti. 6½% pf.	c108½	105	110½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 7% pf.	c110½	109	114
Cons. Gas, Elec. Lt. & Pwr. of Balti. 8% pf.	c124	122	127½
Cons. Gas, Elec. Lt. & Pwr. of Balti. com.—no par	c 44½	32	47½
Cons. Utilities of Dela., 7% pf.	k 85	80	84
Consumers Pwr., 6% pf.	95½	90	97
Consumers Pwr., 6 6% pf.	101	97	102
Continental Gas & Elec., 7% pfc. pf	95	85	97
Continental Gas & Elec., 7% pr. pf.	95	89	97
Continental Gas & Elec., com—no par	125	77	152
Crocker Wheeler, com.	9	9	28
Crocker Wheeler, pf.	48	47	80
Dallas Pwr. & Lt., 7% pf.	102½	100	102½
Dayton Pwr. & Lt., 6% pf.	95	88	100
Dayton Pwr. & Lt., com.	420	180	460
Detroit Edison, com., ex. div.	f135½	110	159½
Dubilier Condenser & Radio, com.	f 9	....	....
Dubuque Elec., 7% pf.	93	80	90
Duquesne Lt., 7% pf.	112½	104	112
East. Tex. Elec., 7% pf.	100	100	105
East. Tex. Elec., com.—no par	83	70	75½
Edison Elec. Illum. of Boston, com.	d209	200	213
El Paso Elec., com.	f 78	....	....
El Paso Elec., pf.	f100	....	....
Elec. Bond & Share, 6% pf.	j104	f103½	f105
Elec. Bond & Share Sec., com.—no par	j 83	f 79	f 86
Elec. Investors, 6% pf.—no par	92	95	96
Elec. Investors, com.—no par	69	30	79½
Elec. Investors, 10% pd. receipts	42	15	62
Elec. Pwr. & Lt., ctfs. pf.	f 92½	89½	94½
Elec. Pwr. & Lt., ctfs., 40% pd.	f107	100	110
Elec. Pwr. & Lt., ctfs. full pd.	104½	100½	110½
Elec. Pwr. & Lt., ctfs. com.	f 32	17½	40½
Electric Refrigeration, w. i.	88	....	....
Elec Ry. Securities, com—no par.	74½	....	....
Elec. Storage Battery, com.—no par	f 73½	60½	80
Elmira Wtr., Lt. & R.R., 7% pf.	96	93	98
Emerson Ele., pf.	k101	95	101½
Empire Dist. Elec., 6% pf.	80	78	85
Engr. Pub. Serv., pf.—no par.	99	100	103
Engr. Pub. Serv., com.—no par.	24	19½	30
Eureka Vacuum Cleaner, com.—no par	k 53½	48½	57½
Fairbanks Morse, com.	f 52½	32½	54½
Fairbanks Morse, pf.	k108½	106½	110½
Federal Lt. & Trac., com.	f 37½	26	37½
Federal Light & Traction, pf.	k 85½	82½	86
Federal Utilities, pf.	f 75	....	....
Federal Utilities, com.	f 17	15½	17
Ft. Worth Pwr. & Lt., 7% pf.	j105	f105½	f107
Galveston-Houston Elec., 6% pf.	64	70	75
Galveston-Houston Elec., com.—no par	25	20	40
Gen. Elec., com.	f328	227½	337½
Gen. Elec., special—10	f 11½	10½	11½
Gen. Gas & Elec., 6% pf.—no par.	k100	72	240
Gen. Gas & Elec., 7% pf.	k100	120	175
Gen. Gas & Elec., com.—no par.	k100	72	240
Gen. Gas & Elec., (Me.) pf.—$7—no par	k100	90	175
Gen. Gas & Elec., (Me.) pf.—$8—no par.	k107	104½	180
Gen. Gas & Elec. (Del.) com. A no par.	59½	42	64½
Gen. Gas & Elec. (Del.) com. B no par.	45	40	62
Gen. Gas & Elec. (Del.) A pf. $8 no par.	110	97½	100
Gen. Gas & Elec. (Del.) A pf. $7 no par.	98	90	111
Gen. Gas & Elec. (Del.) B pf. $7 no par	95	88	97½
Ga. Lt., Pwr., & Rys., 6% pf.	72	74	85
Ga. Lt., Pwr. & Rys., com.	56	25	74
Ga. Ry. & Elec., 5% pf.	k 70	78½	84½
Ga. Ry. & Elec., com.	k126	115½	115½
Ga. Ry. & Pwr., 8% pf.	112	101	114
Ga. Ry. & Pwr., 7% pf.	100	100	102½
Ga. Ry. & Pwr., 4% pf.	k132	62	140
Ga. Ry. & Pwr., com.	149	62	154
Gt. Western Pwr., 7% pf.	h103	....	....
Havana Elec. Util., com.	44½	42	45
Havana Elec. Util., pf.	68½	66	70½
Hurley Machine, com.—no par.	a 51	41½	56
Idaho Pwr., 7% pf.	101½	97½	102
Ill. No. Utilities, 6% pf.	88	82	92
Ill. Pwr. & Lt., 7% pf.	96½	92½	98
Int. Combustion Engr., com.—no par.	f 64½	31½	69½
Int. Utilities, class A—no par	f 38½	32½	40
Int. Utilities, class B—no par.	f 8½	....	....
Interstate Pwr., pf., $7, no par.	96½	90	98
Interstate Pub. Serv., 7% pf.	96½	90	100
Iowa Ry. & Lt., 7% pf.	97	92	100
Jersey Central Pwr. & Lt., 7% pf.	94	90	96
Jersey Central Pwr. & Lt., com.—no par	45	15	50
Johns-Manville, com.—no par.	f159	....	....
Kansas Gas & Elec., 7% pf.	99½	99½	l 101
Kelvinator Corp., com.—no par.	f 87½	....	....
Kentucky Hydro-Elec., pf.	a 93	85½	94
Kentucky Sec., 6% pf.	75	67	78
Kentucky Sec., com.	90	77	100
Kentucky Utilities, 6% pf.	89	82	95
Keystone Pwr. & Lt., 7% pf.	94½	90	95
Kings County Ltg., 7% pf.	101	98	101
Kings County, Ltg., 8% pf.	104	103	106
Laclede Gas Lt., com.	157	110½	178
Lehigh Pwr. Sec., cap.—no par.	180	82	196
Long Island Ltg., 7% pf.	104	100	105
Long Island Ltg., com.—no par.	145	60	142
Los Angeles Gas & Elec., 6% pf.	95	90	98
Manila Elec., com.—no par.	32	28½	49½
Maytag Mfg., com.	22	21½	26½
Memphis Pwr & Lt., pf., $7, no par.	103	98½	102
Metropolitan Edison, pf.—$6—no par	90½	92	96
Metropolitan Edison, pf., $7, no par.	f 102	100	100
Middle West Utilities, 7% pf.	a 97½	91½	99
Middle West Utilities, 7% pr. lien pf.	a107	98	108

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco. *i*Bid, low, high, Tuesday, Jan. 5. *j*Bid, low, high, Wednesday, Jan. 6. *k*Latest quotations available. *l*1926.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Thursday, Dec. 31	Low 1925	High 1925
STOCKS—Continued			
Middle West Utilities, com.—no par	a115	92¼	125
Midland Utilities, pr. in. pf.	a 99	98½	101
Midland Utilities pf. A	a 96	92	97
Milwaukee Elec. Ry. & Lt., 8% pf.	100	98	105
Milwaukee Elec. Ry. & Lt., 7% pf.	98	96	105
Milwaukee Elec. Ry. & Lt., 6% pf.	87	83¾	87
Minn. Pwr. & Lt., 7% pf.	f101	f100½	f102
Miss. Pwr. & Lt., pf.	f100	....	....
Miss. River Pwr., 6% pf.	95	87½	94
Miss. River Pwr., com.	50	37	124½
Montana Pwr., pf.	f112½	109	117
Montana Pwr., com.	f79¼	64	99½
Montreal Pwr., com.	f 215	....	....
Mountain States Pwr., pf.	f 94	....	....
Mountain States Pwr., com.	f 26	....	....
National Carbon, com.	k124	120	130
National Carbon, pf.	a137½	120	137½
National Elec. Pwr., pf.	90	92	97½
National Lt., Ht. & Pwr., 5% pf.	70	40	72
National Lt., Ht. & Pwr., com.—no par	20	11	30
National Pwr. & Lt., pf., $7—no par	101	95	99
National Pwr. & Lt., com.—no par.	475	185	497
National Pub. Serv., 7% pf.	90	90	96
National Pub. Serv., pfc. pf.	93	93	97½
National Pub. Serv., A com.—no par	f 23½	22	30
National Pub. Serv., B com.—no par	f 14	13½	20
Nebraska Pwr., 7% pf.	f102½	f103	f104
Nevada-Calif. Elec., com.	f 32	29	58
N. J. Pwr. & Lt., 7% pf.	104	92	102
New Orleans Pub. Serv., 7% pf.	99	94	102
New Orleans Pub. Serv., com.—no par	k 30	31	38½
N. Y. Central Elec., 7% pf.	97	96	101
Niagara Falls Pwr., 7% pf.—25	28	27½	29
Niagara, Lock. & Ont. Pwr., 7% pf.	k106	101½	110
Niagara, Lock. & Ont. Pwr., com.—no par	k 60½	60	73
Nizer Corp., A.—no par	k 84½	37	84½
Nizer Corp., B.—no par	f 87½	....	....
No. Amer., 6% pf.—50	f49½	46½	50½
No. Amer., com.—10	f64½	41½	75
No. Caro. Pub. Serv., pf.—$7—no par	90	90	96
No. N. Y. Utilities, 7% pf.	f102½	....	....
No. Ohio Pwr., com.—no par	15½	5	19
No. Ohio Trac. & Lt., 6% pf.	75	64	75
No. Ont. Lt. & Pwr., pf.	75	68	78
No. Ont. Lt. & Pwr., com.	49	41	52
No. States Pwr., 7% pf.	99	95	100
No. States Pwr. com.	134	103	144½
No. Texas Elec., 6% pf.	50	60	75
No. Texas Elec., com.	40	40	70
Ohio Gas & Elec., 7% pf.	90	87	100
Ohio Pwr., 6% pf.	92	85	95
Ohio Pub. Serv., 7% pf.	98	97	100
Ohio River Edison, 7% pf.	97½	93½	100½
Oklahoma Gas & Elec., pf.	f 95	....	....
Pacific Gas & Elec., 6% pf.	96½	92	99
Pacific Gas & Elec., com.	129½	102½	137½
Pacific Pwr. & Lt., 7% pf.	j99½	j99	j101
Parr Shoals Pwr., 6% pf.	92	90	100
Penn Central Lt. & Pwr., pf.—no par	c 72½	60	73
Penn-Ohio Elec., 7% pf.	93	83½	96
Penn-Ohio Pwr. & Lt., 7% pf.	96	91	100
Penn-Ohio Pwr. & Lt., 8% pf.	105	101	110
Penn Pwr. & Lt.—$7—no par ex. div.	j103½	j103	j104½
Penn Pub. Serv., 7% pf.	96	90	100
Penn Pub. Serv., 6% pf.	85	80	90
Penn Wtr. & Pwr., com.	155	120	178
Phila. Co., (Pitts.) pf.—50	c 48	37½	49½
Phila. Co., (Pitts.) com.—50	f 68½	51½	68½
Phila. Elec., com.	c 56½	37½	58
Pittsburgh Utilities, pf.	f 16	12½	17½
Portland Elec. Pwr., 7% pf.	96½	95	99
Portland Elec. Pwr., 6% pf.	72	70	80
Portland Elec. Pwr., com.	•••	38	40	53
Portland Ry., Lt. & Pwr., pf.	k 72	....	....
Portland Ry., Lt. & Pwr., com.	k 41	....	....
Pwr. Corp. of N. Y., 7% pf.	k110	96	112
Pwr. Corp. of N. Y., com—no par	77	15	89½
Pwr. Sec., pf.—no par	18	10	55
Pwr. Sec., com.—no par	7	8	30
Pub. Serv. of N. J., 7% pf.	103½	99	106
Pub. Serv. of N. J., 8% pf.	115	108½	119
Pub. Serv. of N. J., com—no par.	f 80½	62½	87½
Pub. Serv. of No. Ill., 6% pf.	96	90	97
Public Serv. of No. Ill., 7% pf.	a110	102	111
Pub. Serv. of No. Ill., com.—no par	a131	107½	132½
Pub. Serv. of No. Ill., com.	a130½	118	131
Pub. Serv. of Okla., 7% pf.	93	87	95
Pub. Serv. Elec. & Gas, 6% pf.	f98½	92½	100½
Puget Sound Pwr. & Lt., 7% pf.	106	102½	107
Puget Sound Pwr. & Lt., 6% pf.	f 85	....	....
Puget Sound Pwr. & Lt., com.	50	49	61
Radio Corp. of Amer., pf.—50	45	45	54
Radio Corp. of Amer., com.—no par	f 42½	39½	77½
Republic Ry & Lt., pf.	92	70	93
Republic Ry & Lt., com.	66	49	67
Rochester Gas & Elec., 5% pf.	95	80	98
Servel Corp., Class A	f 29½	....	....
Servel Corp., Class B—no par	56	35	82½
Sierra Pacific Elec., com.	f 25	....	....
Sioux City Gas & Elec., 7% pf.	98	97½	99½
Southeastern Pwr. & Lt., 7% pf.—no par	97	90	100
Southeastern Pwr.& Lt., com—no par	41	28	43½
So. Calif. Edison, 8% pf.	135	115	128
So. Calif. Edison, 7% pf.	110	105	107½
So. Calif. Edison, 6% pf.	97½	90	95½
So. Calif. Edison, com.	126	102	149
Southern Cities Utilities, 7% pf.	84	77	100
Southern Cities Utilities, com.	45	30	71
Southern Pwr. & Lt. of Md., pf.	f107	....	....
Southern Pwr. & Lt. of Md., com.	f 32	....	....
Southwestern Lt. & Pwr., A	53	52	56
Southwestern Lt. & Pwr., B	38	31½	42½
Southwestern Lt. & Pwr., 6% pf.	78	....	90
Southwestern Pwr.& Lt., 7% pf.	99	90	102
Springfield (Mo.) Ry. & Lt., 7% pf.	96	92	93
Standard Gas & Elec., 8% pf.	f 54½	50½	56½
Standard Gas & Elec., 7% pf.	100	96	100
Standard Gas & Elec., com.—no par	f 56	40½	61
Standard Pwr. & Lt., 7% pf.	108	95	114½
Superheater, com.—No par	f140	....	....
Tampa Elec., com.	290	200	290
Tenn. Elec. Pwr., 6% pf.	f 85	80	87
Tenn. Elec. Pwr., 7% pf.	99	93	103
Tenn. Elec. Pwr., pf.—$6—no par	k 80	72	84
Tenn. Elec. Pwr., com.—no par	k 65	....	....
Tex. Pwr. & Lt., 7% pf.	j102½	f102	f104
Tide Water Pwr., 8% pf.	f 98	....	....
Timken Roller Bearing, com.	f 55½	37½	59½
Toledo Edison, 8% pf.	111	109	114
Toledo Edison, 7% pf.	101	94	101½
Toledo Edison, com.	25	21	25
Tri-City Ry. & Lt., 6% pf.	87	82	85
United Gas & Elec., 6% pf.	92	80	94
United Gas & Elec., com.—no par.	57	26	57½
United Gas & Elec. (N. J.), 5% pf.	65	55	65
United Gas Impr.—50	c122	79½	124½
United Lt. & Pwr., pf.—$4—no par	49	41	51
United Lt. & Pwr., pf.—$6.50—no par	89	83	99
United Lt. & Pwr., com.. A—no par.	127	42	166½
United Lt. & Pwr., com., B—no par.	150	49	100
Utah Pwr. & Lt., 7% pf.	j 99	j 99	j 100
Utica Gas & Elec., 7% pf.	103½	100	104
Utica Gas & Elec., com.	200	100	200
Utilities Pwr. & Lt., 7% pf.	91	90	97
Utilities Pwr. & Lt. com. B—no par	18	12	22
Vermont Hydro-Elec., 7% pf.	92	87	96
Virginia Pwr., 7% pf.	100	94	107
Virginia Pwr., com.	65	65	92
Virginia Ry. & Pwr., com.	k149	64½	150
Wagner Elec., pf.	b 82½	79	92
Wagner Elec., com.—no par	b 34	26½	50
Washington Wtr. Pwr., com.	131	110	140
West Mo. Pwr., 7% pf.	f 91	....	....
West Penn., 7% pf. tem. ctf	95½	94	100
West Penn, com.	f124½	97	145
West Penn Elec., class A, ctfs.	f 89	84½	89
West Penn Elec., pf.	k 97	97	97
West Penn Pwr., pf.	k108½	104	111
West Virginia Lt., Ht. & Pwr., 7% pf.	94	94½	96½
West Va. Utilities, 7% pf.—50	43½	38	47
Western Pwr., 7% pf.	95	84	....
Western Pwr., com.—no par	80	34	102
Western States Gas & Elec., 7% pf.	f 87	....	....
Western States Gas & Elec., com.	f 19	....	....
Westinghouse Elec. & Mfg. com.—50	f 74	66½	84
Weston Elec. Instrument, Cl. A	f 28	19½	28½
Weston Elec. Instrument, com.	f 17½	9½	20½
Wis.-Minn. Lt. & Pwr., 7% pf.	k 90	92	95
Wis. Pwr., Lt. & Ht., 7% pf.	85	85	90
Worthington Pump, pf. A	f 78	76	88
Worthington Pump, pf. B	f 60	58	76½
Worthington Pump, com.	f 43½	35½	79½
Yadkin River Pwr., 7% pf.	j102	f102	f103
Yale & Towne, com.—25	j 64½	62	70½
BONDS			
Abitibi Pwr. & Paper	6s 1940	100	98	101½
Adir. Elec. Pwr.	5s 1962	100	97½	101
Adir. Pwr. & Lt.	6s 1950	f105	....	....
Adir. Pwr. & Lt.	5s 1930	97	94	98
Ala. Pwr.	5s 1946	99	96	100
Ala. Pwr.	5s 1951	95½	92½	97½
Ala. Pwr.	6s 1951	104½	101½	105½
Ala. Trac. Lt. & Pwr.	5s 1962	113½	86	115½
Aluminum Co. of Amer.	7s 1933	106½	106½	107½
Amer. Bosch Magneto	8s 1936	k103	85	101
Amer. Gas & Elec.	5s 2007	91½	90	93½
Amer. Gas & Elec.	6s 2014	97½	96½	99
Amer. Pwr. & Lt.	6s 2016	95½	94	98
Amer. Pub. Serv.	6s 1942	98½	94	99½
Amer. Wtr. Wks. & Elec.	5s 1934	96	92½	98
Amer. Wtr. Wks. & Elec.	6s 1975	94	94	95
Anaconda Copper	6s 1929	103	102½	104
Anaconda Copper	6s 1953	101½	99½	102
Anaconda Copper	7s 1938	104½	99½	105½
Appalachian Pwr.	5s 1941	98	96	99½
Appalachian Pwr.	6s 2024	k 92½	87	94½
Appalachian Pwr.	7s 1936	105½	105	106½
Arizona Pwr.	6s 1933	100	97½	101
Arizona Pwr.	6s 1947	k 95½	90	96½
Ark. Central Pwr.	6s 1948	101	98½	102½
Ark. Lt. & Pwr.	6s 1945	f103	....	....
Ark. Lt. & Pwr.	6s 1954	f 98	....	....
Assoc. Gas & Elec.	6s 1965	94½	92	96
Assoc. Gas & Elec.	6½s 1954	100½	94½	106
Binghamton Lt., Ht. & Pwr.	5s 1946	98½	94½	99
Birmingham Elec.	6s 1954	102	99	103
Birmingham Ry., Lt. & Pwr.	4½s 1954	88½	85	89½
Broad River Pwr.	6½s 1934	100½	99	102
Brooklyn Edison	5s 1949	103	99½	103
Brooklyn Edison	6s 1930	104	103½	106
Buffalo Gen. Elec. 1st	5s 1939	102	100½	102½
Buffalo Gen. Elec. 1st & Ref.	5s 1939	101½	100	101½
Burlington Ry. & Lt.	5s 1932	94½	90	96
Butte Elec. & Pwr.	5s 1951	100	99	100½
Calif. Gas & Elec.	5s 1937	100½	98	101½
Canadian Lt. & Pwr.	5s 1949	55	36	62
Canton Elec.	5s 1937	99½	99	100½
Carolina Pwr. & Lt.	5s 1938	100	98½	100½
Carolina Pwr. & Lt.	6s 1953	104½	103½	105
Cedar Rapids Mfg. & Pwr.	5s 1953	99½	98½	100½
Central Ark. Ry. & Lt.	5s 1928	99½	98½	100
Central Ga. Pwr.	5s 1938	95½	93	97
Central Ill. Lt.	5s 1943	98½	94	99½
Central Ill. Publ Serv.	5s 1952	89½	84½	92½
Central Ill. Publ. Serv.	5½s 1950	95½	96½	98
Central Ill. Pub. Serv.	6s 1944	99½	96½	101½
Central Ind. Pwr.	6s 1947	98	95½	99½
Centralia. Pwr. & Lt.	6s 1944	99½	97	101
Central N. Y. Gas & El.	5s 1941	96½	94	97½
Central Pwr. & Lt.	6s 1946	f100½	....	....
Central Pwr. & Lt.	6½s 1952	f101	....	....
Central States Elec.	5s 1926	k 99	98	102½
Chattanooga Ry. & Lt.	5s 1956	83½	81	85
Cincinnati Gas & Elec.	5s 1956	102	98½	102½
Cincinnati Gas & Elec.	5½s 1957	104½	100½	105
Cities Service	6s 1966	93½	90	93½
Cities Service	7s B 1966	f178	....	....
Cities Service	7s C 1966	126	111	128
Cities Service	7s D 1966	101½	98½	106½
Cities Service	7s E 1966	f109½	....	....
Cities Service Pwr. & Lt.	6s 1944	94	93½	95
City Lt. & Trac., Sedalia, Mo.	5s 1952	84	74	85½
Cleveland Elec. Illum...	5s 1939	102½	100	103
Cleveland Elec. Illum...	5s 1954	101½	97½	102
Cleveland Elec. Illum...	7s 1941	110	109	111½
Colorado Pwr.	5s 1953	f 95	....	....
Columbia Gas & Elec.	5s 1927	99½	99½	101
Columbia Ry., Gas & El.	5s 1936	92½	92½	95
Columbus, Dela. & Marion Elec.	5s 1937	85	83	88
Columbus, Dela. & Marion Elec.	6s 1937	94	91	98
Columbus Elec. & Pwr.	6s 1947	102	....	....
Columbus Ry., Pwr. & Lt.	5s 1940	97	93½	98
Columbus Ry., Pwr. & Lt.	6s 1941	104½	101½	105½
Commonwealth Edison	5s 1943	102	99½	102½
Commonwealth Edison	5s 1953	99½	98½	101
Commonwealth Edison	5s 1954	99½	98	101
Commonwealth Pwr.	6s 1947	103	97½	103½
Community Pwr. & Lt.	6s 1950	98	94½	99
Conn. Ry. & Ltg.	4½s 1951	91½	90½	92½
Consol. Cities, Lt., Pwr. & Trac.	5s 1962	81	75½	82½
Consol. Elec.	5s 1955	97½	94	95½
Consol. Gas of N. Y.	5½s 1945	104½	101½	105
Con. Gas, Elec. Lt. & Pwr. of Balti.	4½s 1935	97	95½	97½
Con. Gas, Elec. Lt. & Pwr. of Balti. (notes)	6s 1949	k106½	104½	106½
Con. Gas, Elec. Lt. & Pwr. of Balti. notes	5½s 1952	k104½	102½	105½
Con. Gas, Elec. Lt. & Pwr. of Balti	5s 1965	c100½	98	100½
Consumers Elec. Lt. & Pwr.	5s 1936	95	93	96½
Consumers Pwr.	5s 1936	100½	99	101
Consumers Pwr.	5s 1952	97½	90½	100
Consumers Pwr.	5½s 1954	102½	99	104½
Continental Gas & Elec.	5s 1927	f100	....	....
Continental Gas & Elec.	6s 1947	f 99½	....	....
Continental Gas & Elec.	6½s 1964	98½	96½	100
Continental Gas & Elec.	7s 1954	f104½	....	....
Cumberland County Pwr. & Lt.	5s 1942	k 95½	92	96½
Dallas Pwr. & Lt.	6s 1949	104	103	105½
Dayton Ltg.	5s 1937	100	98½	100½
Dayton Pwr. & Lt.	5s 1941	100	97	100½
Defiance Gas & Elec.	5s 1942	97	88½	97
Denver Gas & Elec.	5s 1949	98	97½	100
Denver Gas & Elec. Lt.	5s 1951	93½	92½	97
Des Moines Elec.	5s 1938	99	98	100½
Detroit Edison	5s 1933	101	99½	102½
Detroit Edison	5s 1940	102½	99½	102½
Detroit Edison	5s 1949	100½	97½	101½
Detroit Edison	5s 1955	100½	99½	100½
Detroit Edison	6s 1932	k139	110½	155
Detroit Edison	6s 1940	107½	106½	108½
Detroit Edison	7s 1928	134	125	158½
Detroit Edison	7s 1929	k138½	114	140½
Detroit Edison	7s 1930	134	121½	158½
Dominion Pwr. & Trans.	5s 1932	95½	95½	98½
Driver-Harris	5s 1931	96	88	97
Dubuque Elec.	6s 1942	101½	97½	102
Duke-Price Pwr.	6s 1949	102	98½	103
Duquesne Lt.	6s 1949	105½	104½	107½
Duquesne Lt.	5½s 1949	104½	104	106
Durham Pub. Serv.	7s 1949	100	97½	101½
East Penn. Elec.	6s 1953	104½	100½	105½
East Oregon Lt. & Pwr.	6s 1929	100	97½	100½
East. Tex. Elec.	5s 1942	f 95	....	....
Economy Lt. & Pwr.	5s 1956	99	96	99½
Edison Elec. Illum. of Bkln.	4s 1939	93	89	95½
Edison Elec. Illum. (N. Y.)	5s 1995	102½	99½	103
El Paso Elec.	5s 1932	f102	....	....
El Paso Elec.	5s 1950	f 95½	....	....
Elec. Pwr. Corp. (Germany)	6½s 1950	85½	85½	88½
Elmira Wtr., Lt. & R. R.	5s 1956	96	92½	97
Empire Dist. Elec.	5s 1949	91½	86½	93
Erie Ltg.	5s 1967	98	95½	99½
Evansville Gas & Elec. Lt.	5s 1932	99	96	100
Federal Lt. & Trac.	5s 1942	92½	88	96½
Federal Lt. & Trac.	6s 1942	101½	96½	103
Federal Lt. & Trac.	6s 1954	93	91½	94½
Ft. Smith Lt. & Trac.	5s 1936	78	76½	82½
Ft. Worth Pwr & Lt.	5s 1931	99½	99	100½
Galveston Elec.	5s 1940	90	86½	93½
General Elec.	3½s 1942	87½	83	90½
Georgia Carolina Pwr.	5s 1952	86½	82	90
Ga. Lt., Pwr. & Rys.	5s 1941	86	86½	90½
Ga. Ry. & Elec.	5s 1932	98½	93½	100½
Ga. Ry. & Elec.	5s 1949	92½	88	94½
Ga. Ry. & Pwr.	5s 1954	94½	89½	95
Ga. Ry. & Pwr.	6s 1947	102½	100½	103½
Ga. Ry. & Pwr.	7s 1941	105	105	107
German Gen Elec.	7s 1945	95	92	96½
German Gen. Elec.	6½s 1940	94½	94	94½
Great Cons. Elec. Pwr (Japan)	6½ 1950	85½	85½	86½
Great Cons. Elec. Pwr. (Japan)	7s 1944	91	87½	92
Great Falls Pwr.	5s 1940	101½	99½	103½
Great Northern Pwr.	5s 1935	99	96	100
Great Western Pwr.	5s 1946	99	95	99½
Great Western Pwr.	5½s 1955	98½	96	99½
Great Western Pwr.	6s 1949	101½	100	102½
Great Western Pwr.	6s 1952	101½	99½	102½
Hamburg Elec.	7s 1935	95	94½	96
Havana Elec. Ry., Lt. & Pwr.	5s 1954	93	85½	95½
Holtwood Pwr.	6s 1954	103½	100	104½
Houston Ltg. & Pwr.	5s 1931	99½	98½	101
Houston Ltg. & Pwr.	5s 1953	94	90½	95½
Houston Ltg. & Pwr.	5½s 1954	101½	97	102½
Hydraulic Pwr.	5s 1951	100½	99½	102
Hydraulic Pwr.	5s 1950	101	100	103
Idaho Pwr.	5s 1947	96½	93	97½
Ill. Elec. Pwr.	6s 1943	102½	99½	103½
Ill. Pwr.	5s 1933	93½	93	95½
Ill. Pwr. & Lt.	6s 1953	101½	100½	102½
Ill. Pwr. & Lt.	7s 1953	103	99	105
Ind. Elec.	6s 1947	96	96	99½
Ind. Gen. Serv.	5s 1948	95½	92	97½
Ind. Lighting	4s 1958	82½	78	84
Indiana & Mich. Elec.	5s 1957	98½	97½	99½
Indiana & Mich. Elec.	5s 1955	95½	95	98
Ind. Pwr.	7½s 1941	k105½	104	106

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco. iBid, low, high, Tuesday, Jan. 5. jBid, low, high, Wednesday, Jan. 6. kLatest quotations available, 1926.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies			Bid Price Thursday, Dec. 31	Low 1925	High 1925
BONDS (Continued)					
Ind. Service	5s	1950	89½	86½	92
Ind. Service	6s	2020	84	73	88½
Ingersoll-Rand	5s	1935	99½	99½	99½
Interstate Elec	6s	1933	95	95	99½
Interstate Pwr	6s	1944	f 99	....	....
Interstate Pwr	7s	1934	f100	....	....
Interstate Pub. Serv	6s	1948	98½	96	100½
Iowa Ry. & Lt.	5s	1932	k 98½	97	99½
Intl. Pwr. Ser	6⅛s	1928	99½	97½	100
Jersey Cent. Pwr. & Lt.	5½s	1945	k95½	95	98
Kansas City Pwr. & Lt.	5s	1952	100⅛	95½	102
Kansas Elec. Pwr	6s	1937	100½	97½	102
Kansas Elec. Pwr	6s	1943	100½	97½	102
Kansas Gas & Elec	6s	1952	102	98½	103½
Kansas Gas & Elec	6s	2022	91½	86½	94½
Kentucky Utilities	6s	1949	101	97	101½
Kings County Elec. Lt. & Pwr	5s	1937	102	99	103
Kings County Elec. Lt. & Pwr	6s	1997	120	114½	120½
Kings County Ltg	5s	1954	98½	89	101½
Kings County Ltg	6½s	1954	107½	103½	108½
Knoxville Ry. & Lt	5s	1946	94½	88	95½
Laclede Gas Lt	5s	1934	101	98½	101½
Laclede Gas Lt	5½s	1953	102½	95½	103
Laurentian Pwr	6s	1936	100	96	100½
Laurentide Pwr	6s	1936	99	96	100½
Laurentide Pwr	5s	1946	k 99	97	100½
Lehigh Pwr. Sec. (notes)	6s	1927	100½	100½	101½
Lincoln Gas & Elec	5s	1941	91	91	95½
Long Island Ltg	5s	1936	99½	98½	100½
Long Island Ltg	6s	1954	100½	99½	102
Long Island Ltg	6s	1958	105	102	105½
Los Angeles Gas & Elec	5s	1939	100	98	101½
Los Angeles Gas & Elec	5½s	1943	98½	94	99½
Los Angeles Gas & Elec	5½s	1947	98½	96	99½
Los Angeles Gas & Elec	5½s	1949	98½	95½	99½
Los Angeles Gas & Elec	t s	1942	103½	101½	104½
Louisiana Pwr	6s	1944	98½	97	99½
Louisville Gas & Elec	5s	1952	98½	90½	99½
Louisville Gas & Elec	5½s	1954	k102½	99	103½
Lower Austrian Hydro Elec	6½s	1944	86½	85½	87
Luzerne County Gas & Elec	5s	1948	98	97	99½
Luzerne County Gas & Elec	7s	1944	104½	99½	104½
Luzerne County Gas & Elec	6s	1954	102½	99	105
Madison River Pwr	5s	1935	100½	99½	101
Manila Elec	7s	1942	102	97½	103
Manila Elec. Ry. & Ltg.	5s	1953	89½	85	92
Manitoba Pwr	7s	1941	103½	98½	104½
Memphis Pwr. & Lt	5s	1948	k 99	95	99½
Metropolitan Edison	6s	1952	105	101½	106½
Metropolitan Edison	5s	1953	97½	91½	97½
Metropolitan Pwr	6s	1953	103	100	104
Michigan Lt.	5s	1946	99½	97½	100
Michican No. Pwr	5s	1941	98	95½	99
Milwaukee Elec. Ry & Lt	5s	1926	99½	99½	101½
Milwaukee Elec. Ry. & Lt	4½s	1931	97½	94½	97½
Milwaukee Elec. Ry. & Lt	5s	1951	98½	94	100
Milwaukee Elec. Ry. & Lt	5s	1961	90	84½	92½
Milwaukee Elec. Ry. & Lt	6s	1953	100½	98½	104
Minn. Pwr. & Lt	5s	1955	95	95	97
Minn. Pwr. & Lt	6s	1950	104	101½	105½
Miss. River Pwr	5s	1951	99	96½	100½
Miss. River Pwr	7s	1935	102	102	104
Mo. Edison Elec	5s	1927	k 99½	99½	100½
Mobile Elec	5s	1946	k 97	91	98
Montana Pwr	5s	1943	99½	97½	100½
Montgomery Lt. & Wtr. Pwr	5s	1943	k 93	86½	93½
Montreal Lt. Ht. & Pwr.	4½s	1932	97	97	98½
Montreal Lt. Ht. & Pwr.	5s	1933	99½	98½	101
Montreal Pub. Serv	5s	1942	94½	89	94½
Mountain States Pwr.	6s	1938	98½	96½	100½
Nashville Ry. & Lt	5s	1953	97½	94	99
Nashville Ry. & Lt	5s	1958	90½	84	92
Nassau Lt. & Pwr	5s	1927	99½	98	101
Nassau & Suffolk Ltg	5s	1945	90	82	91
National Pwr. & Lt	7s	1972	102½	97	104½
National Pub. Serv	6½s	1955	93½	94	97½
Nebraska Pwr	5s	1949	99½	97	100½
Nebraska Pwr	6s	2022	94	89½	97½
Nevada-Calif. Elec	6s	1946	98½	96½	100½
Nevada-Calif. Elec	6s	1950	98½	96½	100½
New England Pwr	5s	1951	101½	100½	103
New Jersey Pwr. & Lt.	5s	1936	97	92½	97½
New Orleans Pub. Serv.	4½s	1935	87	83½	88½
New Orleans Pub. Serv.	5s	1952	90½	89	92
New Orleans Pub. Serv.	5s	1955	90½	88½	92½
New Orleans Pub. Serv.	6s	1949	90½	86½	93½
N. Y. & Queens Elec. Lt. & Pwr	5s	1930	100½	99½	101
N. Y. & Westchester Ltg.	4s	2004	79½	76	81
N. Y. & Westchester Ltg	5s	1954	97½	93	98½
New York Edison	6½s	1941	115½	112	115½
New York Edison	5s	1944	101½	99½	102
N. Y. Gas & Elec. Lt. Ht. & Pwr	5s	1948	104	100½	104½
N. Y. Gas & Elec. Lt. Ht. & Pwr	4s	1949	89½	86	90½
N. Y. State Gas & Elec	5½s	1962	100½	96	101½
Newport News & Hampton Ry. Gas & Elec	5s	1944	f 87	....	....
Niagara Falls Pwr	5s	1932	101½	99½	103
Niagara Falls Pwr	6s	1932	105½	103	106½
Niagara Falls Pwr	6s	1950	k105½	105½	106½
Niagara, Lock. & Ont. Pwr	5s	1954	k 98½	104½	110
Niagara, Lock. & Ont. Pwr	5s	1955	99	97½	100
Niagara, Lock. & Ont. Pwr	6s	1958	k109½	104½	110½
Norfolk Ry. & Lt	5s	1949	95	93	96
No. Amer. Edison	6s	1952	102	96½	103
No. Amer. Edison	6⅛s	1948	103½	100½	106
No. Amer. Lt & Pwr	7s	1954	99½	97	100½
North Caro. Pub. Serv	5s	1934	f 90½	....	....
North Caro. Pub. Serv	6s	1954	93	91½	96
North Caro Pub. Serv	6⅛s	1944	99	96	100
North Shore Elec	5s	1940	99½	97½	100
No. Calif. Pwr	5s	1948	100	98½	100½
No. Ind. Gas & Elec	5s	1929	99	97	100½
No. Ind. Gas & Elec	6s	1952	102½	99½	103½
Northern N. Y. Utilities	5½s	1949	100	96½	100½
No. Ohio Trac. & Lt	4s	1933	87	82	87½
No. Ohio Trac. & Lt	5s	1956	83	78	87
No. Ohio Trac. & Lt	6s	1926	99	98½	100
No. Ohio Trac. & Lt	6s	1947	92½	91	97
No. Ontario Lt. & Pwr	6s	1931	100	95½	100½
No. States Pwr	6⅛s	1933	130	105½	141
No. States Pwr. (notes)	6⅛s	1933	103	99½	104½
No. States Pwr	6s	1948	103	101	104½
No. States Pwr	6s	1941	105½	103	107½
No. States Pwr	5s	1941	98½	93	99½
No. Tex. Elec	5s	1940	f 75	....	....
Northwestern Elec	6s	1935	102	101½	102½
Northwestern Pub. Serv.	6½s	1948	99½	97½	100½
Ohio Pwr.	5s	1952	93½	89½	96
Ohio Pwr.	6s	1953	103	101	104½
Ohio Pwr.	6s	2024	94½	88½	95½
Ohio Pwr.	7s	1951	k105½	105½	107½
Ohio Pub. Serv	5s	1954	92	87	93
Ohio Pub. Serv	6s	1953	k100½	99	101½
Ohio Pub. Serv	7½s	1946	112½	108	112½
Ohio Pub. Serv	7s	1947	110½	107½	111½
Ohio River Edison	6s	1948	101½	98½	104
Okla. Gas & Elec	5s	1950	92	91	95
Okla. Gas & Elec	6s	1940	95½	95½	98½
Ontario Pwr. of Niagara Falls	5s	1943	100	98	100½
Ontario Transmission	5s	1945	99½	97	99½
Ozark Pwr. & Wtr	5s	1952	k 76	75	79
Pacific Coast Pwr	5s	1940	k 99	98	100
Pacific Gas & Elec	5s	1942	97½	93½	99
Pacific Gas & Elec	5s	1955	93½	94	95½
Pacific Gas & Elec	5½s	1952	101½	99½	102½
Pacific Gas & Elec	6s	1941	106½	103½	107
Pacific Lt. & Pwr	5s	1951	99½	98½	100½
Pacific Lt. & Pwr	5s	1942	99½	98	101½
Pacific Pwr. & Lt	5s	1930	100	98	100
Pacific Pwr. & Lt	5s	1953	96½	....	....
Parr Shoals Pwr	5s	1952	94	92½	97
Paterson & Passaic Gas & Elec	5s	1949	91½	96	100½
Penn Central Lt. & Pwr	6s	1953	103½	102	104½
Penn Edison	5s	1946	96½	93½	97
Penn Elec	6½s	1954	97	96	99½
Penn. Elec	5s	1955	91½	91½	95
Penn.-Ohio Edison	6s	1950	98	96½	98½
Penn Ohio Elec	6⅛s	1938	105	99½	106
Penn Ohio Pwr. & Lt	5½s	1954	98½	95	99½
Penn Ohio Pwr. & Lt	6s	1939	97½	94	99½
Penn Pwr. & Lt	5s	1952	98	95	98½
Penn Pwr. & Lt	5s	1953	98	95	98½
Penn Pwr. & Lt	6s	1953	104½	102½	105½
Penn Pwr. & Lt	7s	1951	105½	105½	107
Penn Pub. Serv	5s	1954	95½	93	96½
Penn Pub. Serv	6s	1947	104	103	105½
Penn Wtr. & Pwr	5s	1940	101½	99½	102½
Penn Wtr. & Pwr	5½s	1953	102½	100	103½
Phila. Co	6s	1944	104	101½	105
Phila. Co	5½s	1938	98½	93½	100
Phila. Co	5s	1951	c 96½	93½	98½
Phila. Co	5s	1949	102½	94½	104
Phila. Elec	6s	1941	c106½	106	108½
Phila. Elec	5s	1966	c103½	100	104½
Phila Elec	4s	1966	k 85½	83	85½
Phila. Elec	5s	1960	c101½	100	104
Phila. Elec	5½s	1947	c106½	103½	107
Phila. Elec	5½s	1953	c107½	104½	107½
Portland Elec. Pwr	6s	1947	100	96½	100½
Portland Gen. Elec	5s	1935	99½	98½	100½
Portland Ry., Lt. & Pwr.	5s	1942	89½	84½	92
Portland Ry., Lt. & Pwr.	6s	1947	99	94	100½
Portland Ry., Lt. & Pwr.	7½s	1946	106	104½	108
Potomac Edison	6s	1949	99½	96	100½
Potomac Edison	6⅛s	1948	103	99	104
Potomac Elec. Pwr	5s	1929	99½	99	100½
Potomac Elec. Pwr	5s	1936	99½	98½	100
Power Corp. of N. Y	6s	1942	101	97	101½
Power Corp. of N. Y	6½s	1942	104½	101½	105½
Power Securities	6s	1949	f 76	....	....
Pub. Lt. & Pwr	5s	1945	69	64	79
Pub. Serv. Co. of Colo	5½s	1954	93½	92	96
Pub. Serv. Co. of Colo	6s	1953	98½	98	101
Pub. Serv. Co. of Colo	7s	1933	101	98½	102½
Pub. Serv. Corp. of N. J.	5s	1959	104½	103½	105½
Pub. Serv. Corp. of N. J.	6s	1944	100½	95	101
Pub. Serv. Co. of No. Ill.	5s	1956	97½	91	98
Pub. Serv. Co. of No. Ill.	5½s	1962	102	96½	102½
Pub. Serv. Co. of No. Ill.	5½s	1964	102	96½	102½
Pub. Serv. Co. of Okla	6s	1949	99	97½	101
Pub. Serv. Elec. & Gas	5½s	1959	103½	98½	105½
Pub. Serv. Elec. & Gas	5½s	1964	103½	99½	105
Public Utilities (Evansville, Ind.)	6s	1929	100	99	101
Puget Sound Pwr	5s	1933	98½	98½	100½
Puget Sound Pwr. & Lt.	5½s	1949	99½	96½	100½
Quebec Pwr	6s	1953	102	98½	102½
Queensborough Gas & Elec	5s	1952	99	96½	100½
Queensborough Gas & Elec	6s	1953	104½	101	105½
Rhine-Westphalia Electric Power	7s	1950	94	94	95
Rio de Janeiro Tram., Lt. & Pwr	5s	1935	93½	85	94½
Robbins & Myers	7s	1952	61½	57½	73½
Rochester Gas & Elec	5½s	1948	105½	102½	105½
Rochester Gas & Elec	7s	1946	112½	110	112½
Rochester Ry. & Lt	5s	1954	100½	99	101½
Rockford Elec	5s	1939	99½	98	101
St. Joseph Ry., Lt., Ht. & Pwr	5s	1937	90	85½	93
St. Paul Gas Lt	5s	1944	100½	98½	101½
St. Paul Gas Lt	5½s	1954	101½	98	102½
Salt River Valley Wtr	6s	1938	f 100	....	....
Salmon River Pwr	5s	1952	100½	98½	101½
San Antonio Gas & Elec	5s	1949	96½	96	98½
San Antonio Pub. Serv	6s	1952	101½	99½	104
San Diego Cons. Gas & Elec	5s	1939	100	98	101
San Diego Cons. Gas & Elec	6s	1939	101½	99	103
San Joaquin Lt. & Pwr.	5s	1945	98½	98	100
San Joaquin Lt. & Pwr.	6s	1950	102	101	103½
San Joaquin Lt. & Pwr.	6s	1952	101½	99½	103½
San Joaquin Lt. & Pwr.	6s	1954	100½	99	101½
Sauda Falls	5s	1955	96	95	98½
Savannah Elec. & Pwr.	7⅛s	1941	f104½	....	....
Saxon Pub. Wks. (Germany)	7s	1945	92½	90½	94½
Scranton Electric	5s	1937	101½	99½	102½
Seattle Elec		1930	f 100	....	....
Seattle Elec	5s	1929	f 99½	....	....
Seattle Elec	5s	1939	92	90	93½
Seattle Ltg	5s	1949	91½	85½	93
Shawinigan Wtr. & Pwr.	5s	1934	100½	100	101½
Shawinigan Wtr. & Pwr.	5½s	1950	104	101½	104½
Shawinigan Wtr. & Pwr.	6s	1950	105	104½	106½
Siemens & Halske	7s	1928	97	92½	99½
Siemens & Halske	7s	1935	94½	90½	96½
Sierra & San Francisco Pwr	5s	1949	76½	75	80
Sierra & San Francisco Pwr	6s	1949	90	87	93½
Sioux City Gas & Elec	6s	1947	101½	99	102½
Sioux City Gas & Elec	6s	1949	101½	99	102½
So. Caro. Gas & Elec	6s	1942	84	87	93
So. Caro. Gas & Elec	6s	1932	75	78	88
Southeast Pwr. & Lt	6s	2025	90	88	92
So. Cal. Edison	5s	1939	k 99½	99	101
So. Cal. Edison	5s	1944	96	92½	97
So. Cal. Edison	5½s	1944	101	98½	102
So. Cal. Edison	6s	1943	102½	100½	104
So. Cal. Edison	6s	1944	104½	102½	105½
So. Cities Utilities	8s	1931	98	99	102
Southern Colo. Power	6s	1947	97½	93½	99½
So. Public Utilities	5s	1943	99½	97½	100½
So. Sierras Pwr	6s	1936	102½	102	104½
So. Utilities	6s	1933	102	97½	102½
So. Wisconsin Pwr	5s	1938	91	88	93
Southwestern Gas & Elec	5s	1932	95½	94	98
Southwestern Gas & Elec	6s	1957	97	89	98
Southwestern Lt. & Pwr.	6s	1937	97½	98	99
Southwestern Pwr. & Lt.	5s	1943	94	90	97
Southwestern Pwr. & Lt.	6s	2022	92½	88½	94½
Southwestern Utilities	8s	1936	96	96	102
Springfield Ry. & Lt	5s	1926	99½	98½	100½
Standard Elec. of Cal	5s	1939	98½	98½	100½
Standard Gas & Elec	6s	1935	f 99	....	....
Staten Island Edison	6⅛s	1953	k106½	104	107
Syracuse Ltg	5s	1951	100½	97½	101½
Syracuse Ltg	5½s	1954	k103	100½	103½
Tampa Elec	5s	1933	f 99	....	....
Tenn. Elec. Pwr	6s	1947	102½	99½	104½
Tenn. Pwr	5s	1962	94½	90	96½
Tex. Pwr. & Lt	5s	1937	98	97	99½
Tex. Pwr. & Lt	6s	2022	94	90	97½
Tide Water Pwr	6s	1942	99½	98½	101
Tide Water Pwr	7s	1937	99½	97½	101½
Toho Elec. Pwr. (Japan)	7s	1955	90½	87	91½
Tokyo Elec. (Japan)	6s	1928	97½	96½	99½
Toledo Edison	5s	1947	k 99	97	100
Toledo Edison	7s	1941	108½	108½	110
Toledo Gas Elec. & Htg.	5s	1935	k 96½	97	100½
Toledo Trac., Lt. & Pr. notes	5½s	1930	98	97½	100½
Topeka Edison	5s	1930	99	97	100
Topeka Ry. & Lt	5s	1933	94½	90½	96½
Trenton Gas & Elec	5s	1949	99½	98	100
Tri-City Ry. & Lt	5s	1930	98½	96½	99½
Twin State Gas & Elec	5s	1953	92½	84	94½
Tyrol Hydro-Elec. Pwr.	7⅛s	1955	96½	94½	97
Union Elec. Lt. & Pwr.	5s	1932	100½	99½	102
Union Elec. Lt. & Pwr.	5s	1933	100½	98½	101
Union Elec. Lt. & Pwr.	5s	1954	k99	97½	100
Union Elec. Lt. & Pwr.	5½s	1954	100½	100	104
United Elec. of N. J.	4s	1949	87½	85	89
United Elec. Lt. & Pwr.	4½s	1929	98	96	100
United Gas & Elec	6s	1945	98	96	101
United Lt. & Pwr. notes	5½s	1928	99½	98	100
United Lt. & Pwr	5½s	1959	94½	90½	97½
United Lt. & Pwr	6½s	1974	95½	92½	97½
United Lt. & Rys	5s	1932	95½	92½	97½
United Lt. & Rys	6s	1926	99½	100½	101½
United Lt. & Rys	6s	1952	98	95½	100½
United Lt. & Rys	6s	1973	89	87	92
United Pwr. & Lt	6s	1944	101½	99	103
Utah Lt. & Trac	5s	1944	87	83½	91½
Utah Pwr. & Lt	5s	1944	95½	91	98½
Utah Pwr. & Lt	6s	1944	k103	102	104½
Utah Pwr. & Lt	6s	2022	k 92½	88½	94½
Utica Elec. Lt. & Pwr	5s	1950	100½	100½	102½
Utica Gas & Elec	5s	1957	100	98½	103
Vermont Hydro-Elec	6s	1929	100	98½	100½
Vicksburg Lt. & Trac	5s	1932	93	89	93½
Virginian Pwr	5s	1942	93	88	96
Virginian Pwr	6½s	1954	102½	99	103½
Virginia Ry. & Pwr	5s	1943	98	93½	99
Wagner Elec. Mfg	7s	....	k101½	100	102
Washington Coast Util.	6s	1941	f102	....	....
Washington Wtr. Pwr.	5s	1939	101½	99½	101½
West Penn Pwr	5s	1963	99½	93½	100½
West Penn Pwr	5s	1946	99½	93½	100½
West Penn Pwr	5½s	1953	104½	100½	106½
West Penn Pwr	7s	1946	106	104½	107½
West Virginia Lt., Ht. & Pwr	6s	1929	k100½	95	101½
West Virginia Utilities	6s	1535	k 95½	91	98
Westchester Ltg	5s	1950	102½	98	102½
Western Elec	5s	1944	100½	98	101½
Western N. Y. Utilities	5s	1946	k96½	90½	97½
Western Pwr	6⅛s	1954	k100½	97	101½
West. States Gas & Elec	5s	1941	f 98½	....	....
West. States Gas & Elec	6s	1947	f 99	....	....
Westinghouse Elec. & Mfg	7s	1931	106	105½	108½
Westphalia Un. Elec. Pr.	6½s	1950	87½	87½	87½
Wisconsin Elec. Pwr	5s	1954	98½	93½	99½
Wisconsin Gas & Elec	5s	1952	99	97	100½
Wis.-Minn. Lt. & Pwr	5s	1944	95½	93	96½
Wis. Ry., Lt. & Pwr	5s	1933	92½	87½	93½
Wis. River Pwr	5s	1941	91	88	92½
Yadkin River Pwr	5s	1941	98½	96½	99½
Yarmouth Lt. & Pwr	5s	1937	83	82	87
Yarmouth Lt. & Pwr	8s	1951	98	97	102

Stock Exchange: cChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco. iBid, low, high, Tuesday, Jan. 5. jBid, low, high, Wednesday, Jan. 6. kLatest quotations available. l1926.

Manufacturing and Markets

Gaining an Interview

Salesman Should Approach Buyer with View of Solving Latter's Problems —Value of Such Interviews

SALESMEN are sometimes looked upon as pests or nuisances, and in the case of some of them the appellation is justified. Officials may refuse to see a salesman chiefly because too many approach a prospective customer with the question: "Are you in the market for buying this or that product?" or some similar introductory inquiry. But no buyer can afford not to see a salesman, and it is becoming more and more the practice never to let a salesman who has called go away without an interview being granted to him. This is a rule that is strictly enforced by some companies, and many a buyer takes cognizance of the fact that a salesman's time should be conserved as well as his own, otherwise the industry suffers a waste. No concern can be classed as modern or as working along the most efficient lines that does not observe these axioms. The announcement that appears on a sign in the reception room of a manufacturer in Cleveland, and is moreover lived up to, can very profitably be adhered to by companies which do not now make it a practice to see salesmen. It is as follows: "Apply to the telephone operator for a pass. Insist on an audience in a reasonable time or a reason for the delay."

Attitude of Salesmen

Numerous officials who object to interviews with salesmen declare that if the majority of salesmen would show a continued interest in their customers' problems—those which might be solved by the product to be sold—and would bring up the subject of purchase only after finding it possible to suggest a solution in that way, it would not be considered that interviews are a waste of time. If the method of seeing every salesman when he calls is to become universal, it behooves all salesmen to bear in mind continually that the first object of every call should be to outline the service which can be rendered to the buyer, even if he does not make a purchase. Such a salesman will be welcome on a second visit, when the ultimate aim of getting an order will be realized—an aim that should always be completely subordinated.

As pointed out in an article on this subject in the April 19, 1924, issue of the ELECTRICAL WORLD, the executive of one company found that because of his department heads refusing to see salesmen the company had persisted in using certain antiquated equipment for twelve years, with a higher operating expense and lower production rate than would have been necessary if a salesman's story had been listened to years before. To avoid a repetition of this experience, and having learned the necessity of granting interviews to all salesmen, that executive has made an arrangement whereby all callers will meet an official who will refer them to the department head or heads most interested in their product.

Method of One Manufacturer

A new reason for seeing salesmen, aside from the information and help which can be obtained from them, was given recently by a manufacturer. This manufacturer declares that he never has an interview with a salesman without devoting the last part of it to telling him something about the benefits derived from using the manufacturer's product and methods. The customer points out to the salesman that he may obtain business elsewhere if he can carry along helpful ideas not connected with his own product. Most salesmen recognize this fact, said the manufacturer, and do not have to be convinced. In other words, this manufacturer endeavors to make every salesman who interviews him an indirect salesman for himself. Possibly this principle can also be applied by other companies.

All Construction Records Broken in 1925

Trend Is Still Upward—New Year Will Probably Run a Close Second if Money Rates Permit

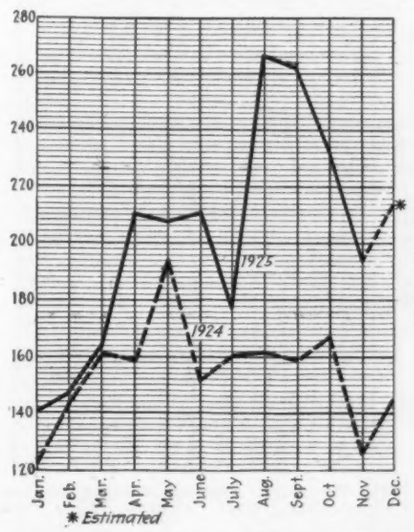
THE greatest building year in history has just ended with no evidence of a let-up in the boom. If there is no further tightening of money rates or a decline in the volume of bond sales for public work, the volume of construction in 1926 will probably be as large as it was in 1925. Million-dollar projects are no longer particularly noteworthy, according to the *Engineering News-Record*. The trend since the beginning of 1924 has been so definitely upward as to indicate that the country has accepted a new standard in building construction.

Boom Confined to Buildings

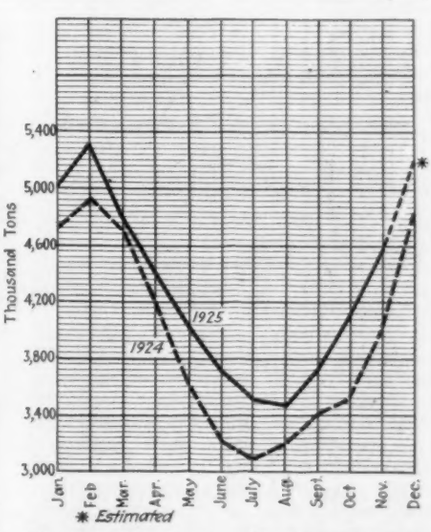
The 270,000 individual buildings in the 1925 program total $5,610,000,000. Of these buildings 231,000 were residential, with a total value of $3,042,000,000. The boom is confined to

CONSTRUCTION STATISTICS FOR LAST YEAR AND THE YEAR PREVIOUS

	Buildings		Other Construction	Total
	Commercial	Industrial		
1925				
New England	$143,908,000	$27,633,000	$27,509,000	$199,050,000
Middle Atlantic	563,984,000	50,015,000	284,584,000	898,583,000
Southern	82,199,000	26,226,000	137,000,000	245,425,000
Middle West	237,104,000	51,464,000	174,428,000	462,996,000
West of Mississippi	168,390,000	43,539,000	200,113,000	412,042,000
Far West	142,292,000	25,143,000	119,416,000	286,851,000
	$1,337,877,000	$224,020,000	$943,050,000	$2,504,947,000
1924				
New England	$95,846,000	$25,794,000	$29,916,000	$151,556,000
Middle Atlantic	339,291,000	54,469,000	207,392,000	601,152,000
Southern	52,555,000	19,355,000	136,162,000	208,072,000
Middle West	211,666,000	56,324,000	163,049,000	431,039,000
West of Mississippi	120,835,000	22,976,000	196,811,000	340,622,000
Far West	115,237,000	26,051,000	125,381,000	266,669,000
	$935,430,000	$204,969,000	$858,711,000	$1,999,110,000



CONSTRUCTION VOLUME AS COMPARED WITH AN INDEX OF 100 FOR 1913



UNFILLED TONNAGE AS REPORTED BY THE UNITED STATES STEEL CORPORATION

In the chart at the left the actual volume of construction is compared and not the mere money value of contracts let. (*Engineering News-Record* statistics.)

buildings, and construction other than buildings is going forward at much the same rate as in 1924. The total construction for the entire country for the year 1925 will approximately amount to $7,500,000,000, breaking all records in the analysis of the construction industry. Of this total, $1,880,000,000 represents construction other than buildings and half of this amount are large engineering construction projects, including roads. The total construction in the United States for 1920 to 1925 is as shown above.

1920....	$3,621,000,000	1923...	$5,483,000,000
1921....	3,560,000,000	1924...	6,012,000,000
1922....	4,927,000,000	1925...	7,500,000,000

Taking a minimum of $15,000 for waterworks and excavations, $25,000 for other public works, $40,000 for industrial and $150,000 for commercial and other buildings, the tabulation appearing on page 125 shows the estimated total for the country during 1924 and 1925.

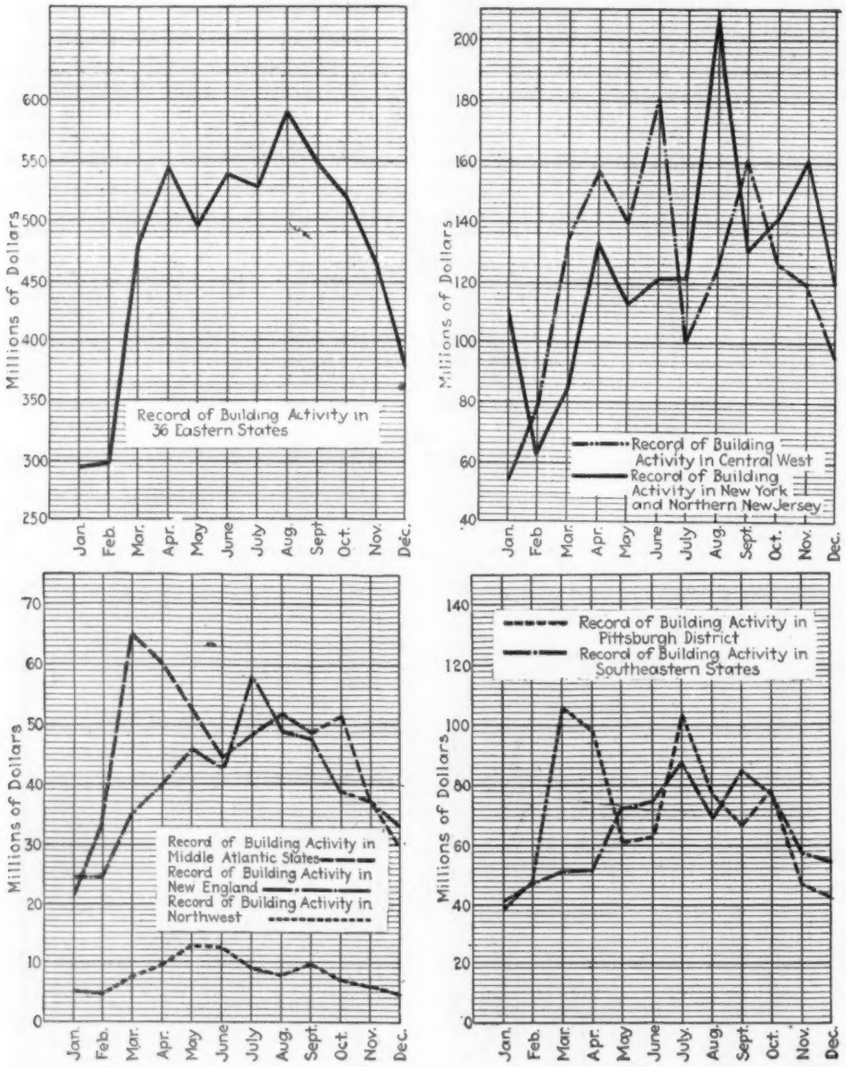
Outlook Favorable for 1926

A study of the various factors that determine new construction indicates another big year ahead. Buildings contemplated already amount to $5,500,000,000. Another billion and a half in contracts may be expected for construction other than buildings. Thus 1926 has all the promise of a seven-billion-dollar year. Construction conditions look particularly favorable in the South, where 10 per cent of the big work of the country is done. Improvement is also looked for in the vast region between the Mississippi and the Mountain States. There are three possible deterrents to be watched—(1) tightening in the money rate, (2) decline in volume of bond sales for public work, (3) smaller volume of contemplated engineering construction (not buildings) than a year ago.

Building Contracts in Thirty-six Eastern States by Territorial Divisions

The Contracts in These States Include About Seven-Eighths of the Total Construction Volume of the Country

(Value of December Contracts Estimated)
(Compiled from the F. W. Dodge Corporation Building Reports)


Millions of Dollars
Record of Building Activity in 36 Eastern States
Record of Building Activity in Central West
Record of Building Activity in New York and Northern New Jersey
Record of Building Activity in Middle Atlantic States
Record of Building Activity in New England
Record of Building Activity in Northwest
Record of Building Activity in Pittsburgh District
Record of Building Activity in Southeastern States
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

The Middle Atlantic States include eastern Pennsylvania, southern New Jersey, Maryland, Delaware, District of Columbia and Virginia.

The Southeastern States include North and South Carolina, Georgia, Florida, Tennessee, Alabama, Mississippi, Arkansas and Louisiana.

The Pittsburgh District includes western Pennsylvania, West Virginia, Ohio and Kentucky.

The Central West includes Illinois, Indiana, Iowa, Wisconsin, Michigan, Missouri, Kansas, Oklahoma and Nebraska.

The Northwest includes Minnesota, the Dakotas and northern Michigan.

More Efficient Production Has Brought Prosperity

Increased Use of Mechanical Power and Better Management a Fundamental Factor in Our Future

INCREASED efficiency of management and increased use of mechanical power in industry, combining to produce more efficient production, are largely responsible for such industrial gains as have recently been made and will be a fundamental factor in our future progress, recently declared Magnus W. Alexander, president of the National Industrial Conference Board. In analyzing industrial conditions at the close of 1925 and the economic factors likely to play a dominant part in the immediate future, Mr. Alexander said:

"Perhaps the most significant, although not the most generally recognized, factor in the achievement of such prosperity as the year 1925 has brought us has been the accomplishment of industry in maintaining a relatively high wage level concurrent with low production costs, resulting in high domestic consumption power. Total production toward the close of 1925 was 42 per cent greater than it had been at the low point of 1924, although only 16 per cent more workers were needed to accomplish this result. Their average "real" weekly earnings are about 25 per cent greater than they were before the war and about 7 per cent higher than at the peak of high wages in 1920. It means for the nation as a whole a larger wealth of goods to enjoy and more capacity to enjoy them, a full purse for the wage earner, with an ample supply of the things he needs or desires at reasonable prices. These are the elements of prosperity.

"Improved industrial organization and administration and the steadily increasing use of mechanical power are primarily responsible for the lowering of production costs, and reduced cost per unit of production has made it possible to maintain the existing high wage level without increasing prices and in some cases even permitting price reductions. It is the proper recognition of this fundamental relationship between high wages, low production costs and domestic consuming power, and the application of the principle involved, that largely determine the degree of our future prosperity. It will be a vital factor in continuing our economic progress, even in the face of increasingly keen foreign competition, while maintaining our existing, or even higher, standards of living.

"If there are any danger signals ahead, it is that the improved conditions, together with our immense gold reserve, aggregating some $4,500,000,000, might lead to another period of inflation, with all the chaos of skyrocket-

ing prices, wage demands and pyramiding of paper profits. Our extensive foreign investments absorb but a small proportion of this reserve. The unprecedented, long-sustained speculative rise in our security markets was a marked example of one of the effects of an unusually large reserve of idle funds. As yet really only a beginning has been made in the direction of mechanizing industrial processes, a field affording immense investment opportunities. The few individual industries which for one reason or another have been lagging behind since the war may also accomplish much by profiting from the example of others in lowering production costs through increased use of power, greater mechanization and improved administration. America today leads the world in industrial organization and statesmanship. We may well face the ensuing year with great confidence."

Business Conditions

STEADY demands from industrial plants continue to characterize buying in the electrical industry. The equipment purchased is mainly for improving efficiency and reducing production costs rather than for general expansion. Many sales of turbo-generators are reported for replacing older and inefficient equipment. Conditions indicate continued interest by industrial plants, and many projects covering plant improvements are known to be in contemplation for immediate action.

Central-station activity includes million-dollar equipment orders for two large projects, one covering additions to existing equipment and the other apparatus for a new plant. Contracts for the necessary apparatus are expected to be signed at an early date. Companies operating central-station properties in the South have been active in the market, and present inquiries from various sections of the country indicate that a good amount of generating equipment will be purchased this year for central-station plant expansion.

In the New England district trade has shown unusual stability and continues steady. The demand from textile centers is of especial interest, the gradual recovery of business in the southeastern Massachusetts district is encouraging, and turbo-generators have been selling well to industrial plants, many negotiations being under way for the purchase of such equipment by paper and rubber companies. Industrial activity continues strong in the New York district, the demand being mainly for material and equipment to be used in reducing the cost of production. Industrial-lighting equipment is selling well in that district, and holding companies operating Southern properties have been active in the market. In the Southeast, industrial activities are everywhere apparent, and the outlook is excellent for that class of business, especially from textile plants. An optimistic, although somewhat reserved, tone regarding trade conditions for 1926 is noticeable throughout the Middle West. Utility companies are planning service extensions and are placing some equipment orders at this time.

On the Pacific Coast the business prospects are good and the general tone is optimistic. Orders for the Feather River and Melones power-house equipment are expected to be placed soon, although litigation may delay the latter order.

Prices of Non-Ferrous Metals Steady—Lead Most Active

MOST sellers of the non-ferrous metals are maintaining a firm policy, without cutting prices in an endeavor to get business, and it is thought that substantial buying cannot be put off very much longer. Sales of copper have been much better than last week, as two or three good-sized orders were booked, one for 1,500 tons by a telegraph company; but the market has been dull. Lead has again been slightly firmer and closely held, especially for early delivery. Aluminum has been reduced 1 cent per pound.

Excellent domestic business is forecast for 1926 and is practically assured for the first half of the year, so that metal producers feel that they are likely to be even more prosperous than in 1925. The foreign markets have been disappointing in the last three or four months. Prices of copper have shown little variation all week, most of the business at the higher-freight-rate points having been booked at 14¼ cents, whereas Connecticut deliveries have sold at 14⅛ cents. Important concessions have in some instances been made for deliveries near refineries or for business that is otherwise attractive, some copper having been sold for as low as 14 cents delivered. In general, however, all sellers are united in quoting on a basis of 14⅛ cents delivered Connecticut points, regardless of time of shipment.

Lead was the first of the metals in which buying in good volume has started since the holidays, the St. Louis market being noticeably more active than New York. While the carload-lot business is not so apparent, the larger users all seem to be in the market, the demand for January lead being strong. The important producers have no large supply for this position but are fairly free sellers for February delivery at current quotations. The zinc market has been virtually unchanged for more than a month and seems likely to remain so until foreign demand reasserts itself. Business in tin has been exceedingly small.

NEW YORK METAL MARKET PRICES

	Dec. 30, 1925 Cents per Pound	Jan. 6, 1926 Cents per Pound
Copper, electrolytic	14⅛	14⅛
Lead, Am. S. & R. price	9¼	9¼
Antimony	23¼	23¾–25
Nickel, ingot	34	35
Zinc, spot	8.90	8.75–9.05
Tin, Straits	62¾	63¼
Aluminum, 99 per cent	29	28

Base copper price Jan. 6, 1926, 16⅛ cents

Industrial Activity Continues Strong in New York District

INDUSTRIAL plant buying continues to command attention in the New York district. Orders have recently been placed for steam-turbine equipment, motors, etc., and a large number of medium-sized orders are in prospect. An order placed by a cement company for a trolley-type electric locomotive is indicative of the trend in buying; that is, the demand is for material and equipment to be used in reducing the cost of production. Industrial lighting equipment is also selling well. One manufacturer reports that sales of that line more than doubled during 1925 as compared with the previous year.

Central-station companies have purchased a steady amount of supplies. Holding companies operating Southern properties have been active buyers. Recent turbine sales include two 20,000-kw. units and one 6,000-kw. unit. Good orders for that class of equipment are anticipated early this year. A manufacturer of insulators reports that sales during 1925 were not equal to those in 1924, there being less transmission-line activity in 1925 than there was the year previous. Sales this year are expected to exceed either of the two previous years. One company has just received an order for insulators amounting to $40,000. Sales of wire and cable are reported in good volume for this period, with large orders for the house-wiring sizes. Jobbers say that the activity so noticeable during the last few weeks in 1925 is still evident, and diversified orders show a large aggregate volume. No let-up is anticipated in this business at present.

Utility Companies Plan Service Extensions in Middle West

AN OPTIMISTIC, although somewhat reserved, tone regarding trade conditions for 1926 is noticeable throughout the Middle West. The various utility companies are planning greater extension of service and are placing equipment orders at this time. Among the interesting orders placed this week are some for the following: Four 15,000-kva., 132-kv., 33-kv. and 12-kv., single-phase, out-door type transformers, five 13,000-amp. 225-275-volt, synchronous converters, and a quantity of circuit breakers and distribution transformers. There has been a good demand for high-tension as well as low-tension insulators.

The jobbers' volume of sales has slackened somewhat during the last week. Most jobbers report a satisfactory year with sales from 25 per cent to 40 per cent ahead of last year. There has been a good demand for washing machines and vacuum cleaners, one jobber placing an order for 250 washing machines and 1,000 cleaners. Prices appear firm with an upward tendency. A reduction of 10 per cent on the list price of pole-line hardware, or about a net reduction of 5 per cent, was an-

nounced this week. There is a persistent rumor that low-tension insulators, particularly strain insulators, will advance the first part of this year, and many utilities and jobbers are anticipating their requirements.

Outlook Good for Industrial Business in Southeast

INDUSTRIAL activities are everywhere apparent in the Southeast, and the outlook is excellent for electrical business of an industrial nature, particularly in the case of textile plants, between now and early spring. Manufacturers report a satisfactory number of inquiries regarding turbine installations, especially in Florida, and definite orders are expected to be placed shortly. Building construction has been heavy during the year just closed, and indications point to a very active building program during 1926.

Little activity is reported in electrical lines in the Southeast, but December business is stated by jobbers as being well in excess of that for the same month of 1924. One large distributor said that his sales for last month were the best on record. General stocks are at a low ebb. The outlook for business early in the year is reported excellent by all dealers, and the larger jobbers are in receipt of orders from large power companies to fill winter and spring campaign requirements, both in appliances and electric ranges, good orders being in immediate prospect for poles, pole-line hardware, insulators, distribution and street-lighting equipment.

Trade in New England District Continues Steady

CONTRARY to the usual precedent, the trade throughout New England showed unusual stability in most lines of electrical supplies and equipment and in so doing fulfilled the predictions made early in the season that the current year would record an encouraging balance for the electrical industry. Sales of small motors continued with a level trend and show, according to one manufacturer, an increase for the year of 17 per cent as compared with 1924. Of perhaps more striking interest is the increasing demand reported from the textile centers and the gradual recovery of business in the southeastern Massachusetts district. In addition, turbo-generators are gaining in good demand, and several recent orders are reported ranging from small units to one of 600 kw. capacity. Paper and rubber companies are manifesting much interest in this type of equipment and a number of negotiations with such concerns are under way. A number of recent sales of electric-heating furnaces are reported by a prominent manufacturer. The future for this type of electrical appliance is undoubtedly very promising in this district on account of the wide range of industrial processes in which it may be utilized and which this district offers.

Central-station and transmission-line supplies are in good demand, and several contracts are pending. One company recently closed an order for switch and control equipment for a Louisiana project. Power and lighting contracts are active among many municipalities and industries. The Naumkeag Steam Cotton Company has signed a new contract with the Salem Electric Lighting Company for the supply of electricity to a connected load of 9,250 hp. in motors and about 300 kw. in lighting. A high peak in the volume of electrical appliance sales for the year was reached during the holiday weeks, and jobbers closed out with encouraging results. One group, consisting of fourteen central-station companies, reported an increase for the entire year of about 10 per cent over the volume of sales for 1924. The closing week of 1925 deserves special mention for the remarkable drift toward new construction as recorded in the contracts let for this district.

Prospects Good on Pacific Coast —Tone Optimistic

BUSINESS prospects are excellent on the Pacific Coast and the general tone is optimistic. Power-company orders are now pending for 2,000 lb. No. 8 bare copper wire, 50 100-amp. 7,500-volt line switches, 20,000 ft. ⅜-in. high-strength strand and twelve carloads of poles in lengths from 30 ft. to 55 ft. Orders for approximately five carloads of pole-line hardware are also expected to be placed in the near future. Supply items covered by recent power-company orders include 10,000 lb. weatherproof tape, 20,000 fuse plugs, 2,000 assorted sizes of conduit bushings and 2,200 assorted condulets. Most of the jobbers have passed the last fortnight in their annual stock inventories and sales conferences, so that their sales of lines requiring special sales efforts are consequently small, and orders have been scattering and rather special.

Manufacturers of large machinery report conditions rather quiet, though 1926 prospects promise an early return to the double-shift factory conditions which prevailed during the past two years. The Feather River, and Melones power-house jobs are expected to come to a head soon, but litigation may delay the latter order for a while. Irrigation company buying has included two carloads of poles and five barrels of glass insulators. Railroad business comprised many items for miscellaneous supplies. Dealers are now experiencing their post-holiday slump. Collections have slightly slowed up because of a little latitude given to holiday-stock orders, but will average about 46 days. Prices are very steady and stronger than during November.

Activities of the Trade

Westinghouse International Gets Large Transformer Order

The Tokio Electric Light Company has placed an order with the Westinghouse Electric International Company for four single-phase 25,000-kva. transformers for 154,000-volt transmission. These transformers are to be duplicates of six others ordered by the same company from Westinghouse about eight months ago. The order also includes high-tension switching equipment for these transformers and has a total value of approximately $400,000.

Seven General Electric Jobbers in Middle West Form Merger

The Lake States General Electric Supply Company, Inc., has been organized with an issued capital of 20,000 shares of no-par common stock. The new company, a merger of seven General Electric jobbers, will operate as a wholesale distributor of electrical supplies in Ohio, Indiana and Michigan. The equipment and merchandise of the companies involved has been taken over and the personnel will be retained.

The companies forming the merger are as follows: The Erner & Hopkins Company, Columbus, Ohio; the Indianapolis Electric Supply Company, Indianapolis; the Crescent City Electric Company, Evansville, Mich.; the A. T. Knowlson Company, Detroit; the Post-Glover Electric Company, Cincinnati (except factory at Ludlow, which will be conducted under the old name as heretofore); the Republic Electric Company, Cleveland and Akron, Ohio, and the W. G. Nagel Electric Company, Toledo (except manufacturing operations, which will be conducted under the old name as heretofore at the Hamilton Street factory). The object in forming this new corporation, as stated in the Jan. 2 issue of the ELECTRICAL WORLD, when it was announced that this merger was in process, is to provide a more effective form of organization and to give better service to its customers. The officers of the new company are: W. C. Nagel, Toledo, chairman of the board; M. A. Pixley, Columbus, Ohio, president; W. G. Clarke, Detroit; L. Griesser, Cleveland; H. E. Rasmussen, Indianapolis, and F. D. Van Winkle, Cincinnati, are vice-presidents, J. T. Dunnick, Columbus, is secretary-treasurer and R. N. Evans, Toledo, is assistant secretary-treasurer.

Westinghouse Company Institutes Prime Mover Sales Department

Effective Jan. 1, the prime-mover sales activities of the Westinghouse Electric & Manufacturing Company will be conducted by a new sales organization at the South Philadelphia works. This announcement was made by E. D. Kilburn, vice-president and general sales manager of the company. The personnel of this new department will include the following appointees: Howell Van Blarcom, formerly assistant to the manager of the power department at the South Philadelphia works, is now manager of the prime-mover sales department; R. E. Carothers, formerly manager of the steam division of the power department at the East Pittsburgh plant, has been made assistant manager; A. H. Ganshird, formerly of

the large turbine section of the East Pittsburgh plant, is now manager of the large turbine section; C. G. Ong, formerly of the central-station division of the Boston office, is manager of the small turbine section, and P. L. Fetzer, formerly of the condenser section at East Pittsburgh, has been made manager of the condenser section of the new department.

The Consolidated Electric Lamp Company, Danvers, Mass., has purchased the General Illuminating Company, Brooklyn, N. Y. It is announced that the present production of 40,000 lamps per day will be increased to 50,000 on the completion of the new plans for factory expansion.

Edwin C. Lewis, Inc., Boston, electrical jobber, has opened a branch store in Copley Square, Boston.

The Servel Corporation, 51 East Forty-second Street, New York, manufacturer of electric refrigerators, announces that it has just closed a large merchandising contract with the Edison Electric Illuminating Company of Boston for the marketing of the Servel machine in its territory. The company also announces that arrangements have been made with British interests for the operation of a British subsidiary with headquarters in London.

The Bates Expanded Steel Truss Company, Illinois Merchants' Bank Building, Chicago, through the Bishop Sales Corporation of Montreal, will supply Bates channel poles and large crossing and terminal towers for the double-circuit, high-voltage transmission line being built by the Riordon Pulp Corporation, Ltd., at Temiskaming, Quebec.

The Link-Belt Company, 910 South Michigan Avenue, Chicago, announces the opening of a branch office in the First Wisconsin National Bank Building, Milwaukee, with R. C. Kendall in charge.

The Electrical Engineers Equipment Company, 708 West Madison Street, Chicago, had its offices damaged by fire during the early morning of Dec. 27, but fortunately the company's records were not destroyed. The factory was not involved in the fire. Temporary office quarters have been obtained until the building can be cleaned and repaired.

The Westinghouse Electric & Manufacturing Company announces that it has placed on the market a "Glassteel" diffuser, consisting of a diffusing glass globe and a white porcelain enameled reflector which directs most of the light downard. An improved line of vapor-proof lighting units has also been added.

The Savage Arms Corporation, Utica, N. Y., is now producing its "Mercury" refrigerating machine for the refrigeration of ice-cream cabinets.

The Erie Electrical Equipment Company, Johnstown, Pa., manufacturer of threadless pipe fittings for switchboards, etc., announces the appointment of the Universal Electric Sales Corporation, with offices at 30 Church Street, New York; 11 Beacon Street, Boston, and 332 Healy Building, Atlanta, as representative in the states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, Pennsylvania (eastern section), New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida, Tennessee and Alabama.

The General Electric Company had its storage building 13 at its Bloomfield plant damaged by fire on the evening of Jan. 5. The loss is said to have been small.

The Everhot Electric & Manufacturing Company, Guarantee Building, Los Angeles, manufacturer of electrical appliances, has plans for the construction of a new two-story plant at 116 Llewllyn Street.

The Graybar Electric Company, formerly the supply department of the Western Electric Company, states that the following four members of its board of directors are officers of the Western Electric Company and not of the Graybar Company as implied in the article appearing in the Dec. 26 issue of the ELECTRICAL WORLD. Howard A. Halligan, vice-president; Richard H. Gregory, comptroller; George C. Pratt, general attorney, and William P. Sidley, general counsel.

The Triumph Electric Company, Cincinnati, announces that Alfred Bourgeois has been a member of its organization since Dec. 15. Mr. Bourgeois was formerly in the sales organization of the Eck Dynamo & Motor Company, where he successively held the positions of sales manager, secretary and president. Prior to that Mr. Bourgeois served as assistant to the vice-president of the Sprague Electric Company for several years.

The Copperweld Steel Company, Rankin, Pa., announces that William J. McIlvane, formerly with the W. N. Matthews Corporation, is now associated with the central-station sales department of the New York office at 30 Church Street. Mr. McIlvane will devote special effort to extending the use of Copperweld guy strand and messenger strand.

New Equipment Available

Field Rheostats

A new line of field rheostats of the round-plate type in which the cast-iron plate previously used has been superseded by pressed steel, has been placed on the market by the Ward Leonard Electric Company, Mount Vernon, N. Y. This type of plate can be furnished completely inclosed, including the terminals. As in the case of the cast-iron plate-type rheostat, the resistive conductor, its contacts and the joints between the contacts and the resistive conductor are completely embedded in vitreous enamel.

Steam Generator

A steam generator, known as the Combustion steam generator, in which practically all of the boiler heating surface is exposed to radiant heat, has been developed by the Combustion Engineering Corporation, Broad Street, New York. The application of pulverized-fuel firing to the generator design permits the elimination of the large furnace with its refractory surfaces, water screens, side-wall screens, etc., required with all existing types of boilers.

The steam-generator unit consists of a furnace, the walls of which are composed of tubes of the fin type, all exposed to radiant heat. Pulverized fuel is introduced through burners in the four corners and burned in a turbulent condition in the form of a vortex, owing to the introduction of the primary mixture of fuel and air as well as the highly preheated secondary air in a direction tangent to an imaginary circle. The flame and gases descend through a multi-tubular water screen into a settling chamber where the ash is deposited and the gases flow through a superheater, thence through an air preheater to the stack or to the induced-draft unit. The horizontal headers for the remaining two side walls are also connected to the lowermost drum, receiving their water supply from this drum and discharging into the upper headers, which in turn are connected to the main drum.

This unit, which can be installed in from one-half to two-thirds the space required for present-day boiler units to produce the same amount of steam, will, it is said, mean a great saving in labor, construction cost and real-estate investment. It is estimated that on a station costing $50,000,000 the use of Combustion steam-generator units would effect a saving between $10,000,000 and $15,000,000 over the present design and construction costs. The time necessary to build and equip a power plant for present-day methods would also be reduced. This new steam generator is said to bring into one unit pulverized-fuel equipment, a completely inclosed water-cooled furnace and the advantages of highly preheated air.

Unit Pulverizer

A unit pulverizer discharging the pulverized product directly into the furnace where it is burned and known as the Riley "Atritor" has been placed on the market by the Riley Stoker Corporation, Worcester, Mass. In this unit is a preliminary breaker compartment or "first effect," where metal or other foreign material is also passed out. The coal is carried in a current of hot air around the outside of a revolving disk in a second compartment, giving the "second effect." With the use of hot air the coal is dried as it is being ground.

The mixture of coal and air then passes through a "rejector," the effect of which is to throw the heavier particles of coal back into the pulverizing compartment until it is fine enough for combustion. When passing through the "second effect" the pulverized material flows against centrifugal force, providing a further screening effect. The power consumption of the pulverizer is said to be unusually low. The unit is provided with radial roller bearings.

New Trade Literature

FURNACE.—The Combustion Engineering Corporation, Combustion Engineering Building, Broad Street, New York City, is distributing catalog FF-1, which describes and illustrates the "C-E Fin" furnace, a water-cooled furnace, which is designed for use in high-pressure plants. It contains drawings showing various applications of the boiler, equipped with the "Lopulco" pulverized-fuel system.

INDUSTRIAL CONTROL EQUIPMENT. —An industrial control catalog (GEA-257) has been issued by the General Electric Company, Schenectady, N. Y., covering its line of industrial control. It includes a reprint of the industrial control section of its general catalog. It contains instructions on care and operation of control devices, wiring diagrams of some standard controllers, push-buttons, reference tables, etc.

AIR COMPRESSORS.—Bulletin No. 126 issued by the Pennsylvania Pump & Compressor Company, Easton, Pa., describes the Pennsylvania duplex, single-stage and two-stage, cross-compound air compressors, classes "DR" and "DE." Illustrations are given showing various applications of the compressor. Tables of sizes and capacities of types "HC" and "VC" after-coolers and of the compressors are included.

POLYPHASE TRANSFORMERS. — The Pittsburgh Transformer Company, Pittsburgh, Pa., is distributing bulletin No. 2050, covering the Pittsburgh polyphase transformers. Illustrations are given showing typical installations of the transformer with and without expansion tank.

UNIT PULVERIZER.—Bulletin No. 7 issued by the Grindle Fuel Equipment Company, Harvey, Ill., describes the Grindle multi-stage unit pulverizer for firing boilers, furnaces, ovens, etc. It contains illustrations of various typical installations and a diagram showing a cross-section of the multi-stage construction and bearing arrangement.

WALL FIXTURE.—The American Blower Company, Detroit, is distributing a folder calling attention to a new permanent wall fixture for the reversible "Ventura" ventilating fan for use in the kitchen, laundry, nursery, etc.

PANELBOARDS AND CABINETS. — Bulletin No. 1G issued by the Crouse-Hinds Company, Syracuse, N. Y., describes and illustrates the various types of the Crouse-Hinds panelboards and cabinets. It contains data on box drilling and motor panelboard and also general panelboard and cabinet specifications. A pictorial index is included.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase is desired in Hamburg, Germany (No. 18,498), of armatures.

Purchase is desired in Madrid, Spain (No. 18,517), of electric generators and machinery for construction of hydro-electric and hydraulic equipment, including turbines.

Purchase is desired in Lyons, France (No. 18,524), of electric household appliances.

Purchase is desired in Breslau, Germany (No. 18,522), of radio sets and parts.

Purchase is desired in Glasgow, Scotland (No. 18,523), of electrical welding plant.

Purchase and agency is desired in Zagreb, Yugoslavia (No. 18,525), of wiring material for residences.

Purchase is desired in Durban, South Africa (No. 18,516), of eleven electrically driven wharf jib cranes and seven electric capstans for harbor use.

An agency is desired in Shanghai, China (No. 18,458), for ice-making machinery from 1 ton to 10 tons capacity.

Purchase or agency is desired in Nantes, France (No. 18,595), for electrically driven pumps; also machine tools for electrical, automotive, metal and other industries (No. 18,572).

Purchase or agency is desired in Melbourne, Australia (No. 18,625), for electrical advertising apparatus and office devices, radio sets and parts, telephone accessories and cables.

Purchase is desired in Marseilles, France (No. 18,609), of electrolytic copper in wire bars or machine wire.

Purchase or agency is desired in Singapore, Straits Settlements (No. 18,569), for electrical and mechanical supplies.

Purchase and agency is desired in Bombay, India (No. 18,578), for fans, lamps and other electrical appliances.

Purchase is desired in Tegucigalpa, Honduras (No. 18,566), of small water-wheel-driven generator sets.

Purchase is desired in Ballarat, Australia (No. 18,583), of hot plates for electric ranges.

An agency is desired in Hamburg, Germany (No. 18,585), for electrical household appliances.

An agency is desired in Paris, France (No. 18,586), for electrical household appliances, particularly dishwashing machines and refrigerating equipment for domestic use.

Purchase is desired in Lisbon, Portugal (No. 18,564), of machinery for hydro-electric development.

Purchase is desired in Rotterdam, Netherlands (No. 18,608), of magnesia composition for insulation.

An agency is desired in Kovno, Lithuania (No. 18,584), for radio sets and parts.

An agency is desired in Frankfort, Germany (No. 18,574), for measuring instruments, calipers, etc.

An agency is desired in Magdeburg, Germany (No. 18,573), for boiler and engine accessories.

Purchase and agency is desired in Pernambuco, Brazil (No. 18,612), for ice-making machinery, machinery for extracting tannin from angico bark and especially motors, pulleys, accessories, generators, boilers and vacuum evaporators.

An agency is desired in Berlin, Germany (No. 18,576), for refrigerating machinery.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

PLYMOUTH, N. H.—The Draper Corporation, Hopedale, Mass., plans to install electric power equipment in its proposed local bobbin plant, to cost about $450,000.

SPRINGFIELD, MASS. — The United Electric Light Company has acquired property adjoining its station at Bond and North Streets, on which it plans to build an addition.

NEW LONDON, CONN.—The City Commission is planning extensions in the street lighting system in connection with a proposed new street-lighting contract with the Connecticut Power Company.

WATERBURY, CONN.—Plans for the proposed factory addition of the Lux Clock Company include a power plant. Thomas M. Freney, Waterbury, is architect.

Middle Atlantic States

BROOKLYN, N. Y.—The Long Island Railroad Company, New York, appropriated $4,040,000, for the electrification of its Bay Ridge Division, including the Bay Ridge terminal yards, during 1926. The Montauk Division will be electrified from Long Island City to the Holban yards, including the four yards and terminals at Long Island City, Blissville, Fresh Pond and Holban, respectively, during 1927, at a cost of about $6,000,000.

BUFFALO, N. Y.—Plans have been filed by the United States Rubber Reclaiming Corporation, 728 Babcock Street, for the erection of a new power house at its local plant, to cost about $20,000.

HOOSICK FALLS, N. Y. — The Twin State Gas & Electric Company, Boston, has applied to the Public Service Commission for authority to extend its electric distribution system to serve the villages of Eagle Bridge and Buskirk. It is proposed to erect a line through the towns of Hoosick and Cambridge.

PERRY, N. Y. — The City Council is considering plans for the installation of an ornamental lighting system on Main Street.

ROCHESTER, N. Y.—Plans are under way by the Rochester & Gas Company for the erection of a new switch house at Mill Street and Brown's Race, to cost about $750,000. The proposed change in the control system will necessitate considerable underground conduit and cable work.

SCHENECTADY, N. Y.—Permission has been granted the Adirondack Power & Light Corporation to erect a transmission line (about 4¼ miles long) through the town of Marcy to connect with the Deerfield branch of the Utica Gas & Electric Company.

CLIFTON, N. J. — The Public Service Electric & Gas Company, Newark, has purchased a local site on which it proposes to build a substation and distributing plant, to cost about $500,000.

PHILADELPHIA, PA.—The Bisbee Linseed Company, Drexel Building, plans to install electric power equipment in connection with the proposed rebuilding of its mill at South Philadelphia, recently damaged by fire with loss of about $200,000.

READING, PA. — The Carpenter Steel Company plans to install electric power equipment in connection with the proposed rebuilding of its wire nail mill recently damaged by fire, with loss of about $200,000.

BALTIMORE, MD.—Extensions and improvements, to cost about $6,000,000, are contemplated by the Consolidated Gas, Electric Light & Power Company during 1926. The erection of a transmission line to Westminster is also under consideration.

LONACONING, MD. — The property of the Home Electric Light Company has been acquired by Frank A. Graves, president of the Chagrin Valley Electric Company, Chagrin Falls, Ohio. Extensions and improvements including line construction are under consideration.

OCEAN CITY, MD.—The local electric plant of the Eastern Shore Gas & Electric Company, Salisbury, was recently destroyed by fire, causing a loss of about $50,000.

HUNTINGTON, W. VA.—Plans for the proposed local glass manufacturing plant to be built by the Weston (W. Va.) Glass Company, to cost about $50,000, include a power plant.

SHEPHERDSTOWN, W. VA. — The Potomac Edison Company, Hagerstown, Md., which recently acquired the plant of the Shepherdstown Light & Water Company, contemplates extensions to its transmission lines in this section.

North Central States

BERRIEN SPRINGS, MICH.—The Indiana & Michigan Electric Company, South Bend, Ind., plans to rebuild its local power plant, recently damaged by fire with a loss of about $30,000.

JACKSON, MICH.—Plans have been authorized by the State Prison Commission, Lansing, for a power plant at the local state prison, to cost about $500,000. Harry L. Hulbert is engineer in charge of construction.

CLEVELAND, OHIO. — The Newburg Steel Company, 6318 Kinsman Road, plans to install electric power equipment in a proposed plant on Collamer Avenue, to cost about $400,000.

DAYTON, OHIO. — The Aetna Paper Company plans to install electric power equipment in the proposed additions to its mills on Franklin Avenue, to cost about $1,000,000.

ELYRIA, OHIO.—The installation of an ornamental lighting system in the business district has been approved by the City Council.

GREENVILLE, OHIO. — The Citizens Heat, Light & Power Company, Winchester, Ind., which recently acquired the local plant of the Jantha Light & Fuel Company, plans to erect a transmission to Greenville, with extensions to several communities in this section.

LOGAN, OHIO.—Plans for the proposed local brick manufacturing plant to be built by C. E. Campbell and Charles Addock, to cost about $100,000, include a power plant.

SALEM, OHIO.—Plans are under way by the Pennsylvania-Ohio Power & Light Company, Youngstown, to erect a new transmission line to Salem, via Boardman, Canfield and Greenford.

INDIANAPOLIS, IND. — The Commissioners of Marion County are considering the installation of boilers and automatic stokers in the power plant at the Sunnyside Tuberculosis Hospital, to cost about $15,500.

CHICAGO, ILL.—Plans for the proposed stone cutting plant to be built by R. Oates & Son, 2453 North Crawford Avenue, to cost about $50,000, include a power plant.

CHICAGO, ILL.—Bids will be received by the Construction Division, Veterans' Bu-

reau, Washington, D. C., until Jan. 19, for radio equipment for its buildings at North Chicago. Also, until Jan. 26, for radio equipment for San Fernando, Cal.

CHICAGO, ILL.—Electric power equipment will be installed in the proposed plant to be built at Augusta Street and Cicero Avenue, by the Schuter-Johnson Candy Company, 20 North Jefferson Street, to cost about $300,000.

HULL, ILL.—Plans are under way by the Central Illinois Public Service Company, Springfield, for the erection of two new 33,000-volt transmission lines from Hull to Quincy, connecting with the Keokuk line. The company will continue to use the present line from Quincy to Hull.

SPRINGFIELD, ILL.—Bids will be received bp the Board of Trustees of the Springfield Sanitary District, City Hall, until Jan. 26 for Divisions E, F, G, H and I of the West Side intercepting sewers and appurtenances. Division H, includes the construction of the Walnut Street sewage pumping station and the erection of pumping equipment; Division I, includes five electric motor-driven vertical centrifugal pumps having an aggregate capacity of 26 million gallons per twenty-four hours.

ANTIGO, WIS. — Work will begin by the Wisconsin Valley Electric Company, Wausau on the erection of a high-tension transmission line to Antigo as soon as the weather will permit. Later it is proposed to extend this line to Elcho, to connect with the line running from Rhinelander.

MILWAUKEE, WIS.—Plans are under way by the Milwaukee Electric Railway & Light Company for the erection of 200 miles of rural lines in 1926, to cost about $1,000,000. It is proposed to serve between 1,200 and 1,500 farmers in Dodge, Fond du Lac, Jefferson, Kenosha, Milwaukee, Ozaukee, Racine, Sheboygan, Walworth, Washington and Waukesha Counties. Ultimately it is hopd to reach 25,000 farmers, now without service.

SHOREWOOD, WIS. — Bonds to the amount of $30,000 have been issued for the installation of an electric lighting system. Theodore B. Olson, 1591 Murray Avenue, Milwaukee, is village clerk.

SLADES CORNERS, WIS.—An agreement has been reached between the Southern Wisconsin Electric Company, Lake Geneva, Carey Electric & Milling Company, Wilmot, and the Wisconsin Gas & Electric Company, Racine, whereby the Southern Wisconsin Electric Company will build an extension from Lake Geneva to Slades Corners. A high-tension transmission line will be erected by the Wisconsin Gas & Electric Company from Burlington to Slades Corners, where it will construct a substation to accommodate the lines of the other two companies in emergencies.

TREGO, WIS. — Permission has been granted the Wisconsin Hydro-Electric Company, Amery, to build a dam, 560 ft. long and hydro-electric plant on the Namakagon River, near Trego. Ralph D. Thomas, 1200 Second Avenue South, Minneapolis, is engineer.

BINGHAM LAKE, MINN.—Bonds have been issued to install an electric-lighting system. It is proposed to secure electricity from the People's Light & Power Company, Lamberton.

EAST GRAND FORKS, MINN.—The Otter Tail Power Company, Fergus Falls, plans to build a local power plant, equipped with two units of 2,000 hp. each, to cost about $400,000.

FORT SNELLING, MINN.—Bids will be received by the United States Veterans' Bureau, Room 791, Arlington Building, Washington, D. C., until Jan. 26, for construction of buildings and utilities at Fort Snelling. Separate proposals will be received for building construction, plumbing, heating, electrical work, elevators, ice-making and refrigerating plant and chimney.

MINNEAPOLIS, MINN.—The merchants on Sixth Avenue North have petitioned the City Council for the installation of ornamental lamps in the Lyndale-Sixth Avenue North district.

GRANT, IOWA.—Application has been made to the Council by J. W. White, operating electric systems in Bridgewater, Cumberland and Massena, for a franchise to install a system in Grant.

MUSCATINE, IOWA. — Bonds to the amount of $100,000 have been authorized, the proceeds to be used for extensions to the municipal electric light plant.

SPRINGFIELD, MO.—The Midmountain Fruit Company plans to install electric power equipment at its proposed new canning plants, to cost about $300,000.

SPRINGFIELD, MO. — Extensions and improvements are under way by the Springfield Gas & Electric Company, involving an expenditure of $1,000,000. The work includes an addition to the power station (now under construction) and the installation of a 10,000-hp. turbine.

CUMMINGS, N. D.—The Northern States Power Company, Minneapolis, Minn., contemplates erecting a transmission line from Cummings to Hatton.

GRAND FORKS, N. D.—Plans are being considered by the Ottertail Power Company, Fergus Falls, Minn., to erect a transmission line to connect Niagara, Gilby, Hoople, Adams, Fairdale, Minto and Fordville.

ABERDEEN, S. D. — Plans are under way by the Northwestern Public Service Company, Huron, for the construction of a local light and power plant. Similar plants are also contemplated at Mitchell and Columbus, Neb. The cost of the entire work is estimated at $500,000.

GERING, NEB.—Bonds to the amount of $28,000 have been issued, the proceeds to be used for the installation of an electric lighting system.

LINCOLN, NEB.—The State Board of Control is considering extensions and improvements in the power plant at the local state penitentiary to cost about $100,000. E. B. Fairfield is secretary.

Southern States

PARR SHOALS, S. C.—The Broad River Power Company, Columbia, S. C., plans extensions and improvements to cost $2,500,000, during 1926, including the installation of an additional unit at the Parr Shoals steam-operated power plant, addition to substation at Spartanburg, and extensions in transmission lines.

HOMERVILLE, GA.—The installation of an electric lighting system, to cost about $15,000, is under consideration by the City Council.

TIFTON, GA.—An election will be held on Feb. 11 to vote on the proposal to issue $90,000 in bonds for municipal improvements, of which $10,000 will be used for extensions and improvements to the street lighting system.

DELRAY, FLA.—Bonds to the amount of $900,000 have been voted for municipal improvements, of which $263,000 will be used for extensions to the municipal electric light plant and lighting system.

DINSMORE, FLA.—The installation of an electric lighting system in Dinsmore is under consideration by the Commissioners of Utilities.

FERNANDINA, FLA.—The City Council is considering calling an election to vote on a $500,000 bond issue for municipal improvements, including extensions to the electric lighting system and waterworks.

FORT MYERS, FLA. — The Southern Utilities Company, Palatka, is reported to be considering extensions and improvements in Fort Myers, involving an expenditure of $1,500,000, during 1926.

KISSIMME, FLA.—An election will be held on Jan. 2 (extensions of date) to vote on the proposal to issue $30,000 in bonds for the installation of an electric lighting system, including ornamental lamps.

GREEN COVE SPRINGS, FLA.—Plans are under consideration by the City Commission for extensions and improvements in the municipal electric lighting plant.

LAWTEY, FLA.—Bonds to the amount of $20,000 have been approved for the installation of an electric-lighting system.

MIAMI BEACH, FLA.—The City Council is considering a bond issue of $7,888,000 for municipal improvements, including ornamental lighting system, sewers, waterworks, fire-alarm system, etc.

SILVER SPRINGS, FLA. — Plans are under way by the Silver Springs Development Company, which has acquired Silver Springs and 9 miles frontage on Silver River, for establishing a townsite, to include an electric plant and distributing system, waterworks, etc. The entire cost of the project is estimated at $7,000,000. McDonald & Company, Hurt Building, Atlanta, Ga., architects and engineers, are in full charge of the work.

VERO BEACH, FLA.—Plans are under way for the installation of an ornamental lighting system, covering twenty-six blocks, to cost about $43,000.

ATHENS, TENN.—The Tennessee Electric Power Company, Chattanooga, which recently acquired the Athens Ice & Cold Storage Company, contemplates extensions in the ice-manufacturing plant.

CLARKSVILLE, TENN. — The installation of an ornamental lighting system in the business section, to cost about $25,000, is under consideration by the City Council and property owners. S. R. Alexander is city engineer.

NASHVILLE, TENN. — Bonds to the amount of $100,000 have been voted for new boiler equipment and reconditioning the power plant at Nashville General Hospital.

NASHVILLE, TENN.—Plans are under consideration by the Cumberland Telephone & Telegraph Company for extensions to its local system, to cost about $3,000,000.

PARIS, TENN. — The Kentucky-Tennessee Light & Power Company, Bowling Green, Ky., is considering extensions in its transmission lines in this section.

RIVERVIEW, TENN.—A bond issue of $38,000 is under consideration by the town officials for municipal improvements, including a lighting system. Post office address Chattanooga.

JACKSON, MISS. — The Mississipp Power & Light Company plans to erect a high-tension transmission line, 100 miles long, during 1926, connecting points in the Yazoo-Mississippi delta, now served by the company, with Jackson. The cost is estimated at $500,000.

MARSHALL, ARK. — The local electric plant has been acquired by H. W. Wright, 601 Clark Street, St. Louis. The new owner, it is understood, plans to erect a new building.

MARERRO, LA.—Electric power equipment will be installed in the proposed addition to the local plant of the Celotex Company, 645 North Michigan Boulevard, Chicago. Extensions in power plant are also under consideration. The cost is estimated at $1,500,000.

BLACKWELL, OKLA. — The Blackwell Mill & Elevator Company is considering the installation of a Diesel engine and other equipment at its local plant.

BRISTOW, OKLA.—Plans for the proposed glass manufacturing plant to be erected by the Blue Mountain Glass Company, Inc., to cost about $60,000, include a power plant.

DURANT, OKLA.—The Oklahoma Gas & Electric Company, Oklahoma City, plans to build a local substation. A transmission line will be erected from Madill.

KINGFISHER, OKLA. — Bonds to the amount of $40,000 have been voted for extensions and improvements to the municipal electric plant.

OKLAHOMA, OKLA. — Extensive additions are contemplated by the Oklahoma Gas & Electric Company during 1926, which will include the erection of a 63,000-volt transmission line between Ada and Sulphur, 30 miles long, to connect with the line from the power station at Byng; a 63,000-volt line from Ardmore to Davis, a distance of 27 miles; the erection of a substation at Ardmore, and 2½ mile 13,000-volt extension to serve additional power at the municipal waterworks. The entire electric distribution system will be rebuilt at Tishomingo. The Ardmore-Durant transmission line, now operating at 13,000 volts will be rebuilt for 33,000 volts, and changes made in substations. A new substation will be built in Durant. Frank S. Partridge, construction superintendent will be in general charge of all the work.

CRYSTAL CITY, TEX.—The erection of a high-tension transmission line from Crystal City to River Spur, to cost about $30,000, is under consideration by the Crystal City Electric Light & Ice Company.

DALLAS, TEX.—Plans are under way by the City Commission for the installation of an ornamental lighting system on Young Street, from Harwood to Houston Streets, to cost about $40,000.

PADUCAH, TEX. — The West Texas Utilities Company, Abilene, which recently acquired the plant of the Paducah Electric Company, plans to erect a transmission line from Abilene, and to install a substation here.

Pacific and Mountain States

ELLENSBURG, WASH. — The Puget Sound Power & Light Company, Seattle, plans to erect a transmission line down the west side of the Yakima River from the South Cle Elum substation through Thorp and connect with the line of the Kittitas Power & Light Company, and from there it will extend its lines wherever there is sufficient demand to justify the extension.

MONTESANO, WASH.—Permission has been granted the Puget Sound Power & Light Company, Seattle, to erect transmission lines, both trunk and branch lines, over roads near Montesano and in the eastern part of Grays Harbor County.

WALLA WALLA, WASH. — Improvements are contemplated by the Pacific

Power & Light Company, Portland, Ore., in the Walla Walla district during 1926, to cost from $65,000 to $70,000. The work will include a high-tension line to Prospect Point district, to cost $28,000, replacement of the Sixth Street feeder, new transmission lines, etc.

CRESCENT CITY, CAL. — Plans have been approved by Hobbs, Wall & Company, Fife Building, San Francisco, for extensions in the electric power plant at its local lumber and woodworking mill, including the installation of a generator, engine, etc. Electric power equipment will also be installed in a proposed planing mill. The cost of the project is estimated at $300,000.

CRESTLINE, CAL.—A petition has been filed with the Supervisors of San Bernardino County by Fred D. Cats, Crestline, for a franchise to erect a transmission line from Crestline to Arrowhead Lake.

INGLEWOOD, CAL.—The City Council plans to install ornamental lamps on West Boulevard, from Sixty-fourth Street to Redondo Boulevard, including a number of adjoining streets, using concrete standards.

LOS ANGELES, CAL.—Plans are being prepared by the Municipal Power Bureau for the construction of the first unit of the proposed steam-operated electric plant at San Pedro Harbor. The cost is estimated at $3,000,000. H. C. Gardett, chief of construction, is in charge.

LOS ANGELES, CAL.—Plans are under way to install ornamental lamps on portions of Thayer Avenue, to cost $50,000; on Soto and First Streets, using Marbelite standards, $25,000; Adams Street, $25,000; Jefferson Street, $25,000 and York Boulevard, $40,000.

MERCED, CAL.—The San Joaquin Light & Power Corporation, Fresno, contemplates the construction of a steam-operated electric power plant near the city limits, to cost $500,000 also extensions in its transmission lines in this district, to cost about $200,000.

OROVILLE, CAL.—The Oroville-Wyandotte Irrigation District, care of R. A. Leonard, Oroville, has applied for permission to build a hydro-electric power project on the South Fork of the Feather River and other streams in Plumas and Butte Counties, in connection with an irrigation system, to develop a total output of 75,000 hp. The cost is estimated at $4,000,000, with transmission system.

REDONDO BEACH, CAL. — The City Council has authorized the installation of ornamental lamps on Pier Avenue. Victor H. Staheli is city engineer.

SACRAMENTO, CAL.—The City Council is considering the installation of ornamental lamps on M Street, between Front and Ninth Streets, using cast metal standards. A. J. Wagner is city engineer.

SAN DIEGO, CAL.—The San Diego Consolidated Gas & Electric Company plans to increase the output of its power plant at Fourth and Date Streets, by 20,000 hp., and also to install additional machinery in the power plant at the foot of E Street. The entire cost is estimated at $1,000,000.

SAN FRANCISCO, CAL. — The Great Western Power Company of California plans to erect a transmission line from San Francisco to various points in San Mateo County, covering about 22 miles.

SAN JUAN BAUTISTA, CAL.—The Old Mission Portland Cement Company, Standard Oil Building, San Francisco, plans to install electric power equipment in connection with proposed extensions in its local mills, to cost about $750,000.

WATSONVILLE, CAL. — The Coast Counties Gas & Electric Company, Salinas, plans to erect a transmission line from Morgan Hill, via Mount Madonna, for local service, at a cost of about $250,000. Extensions and improvements are contemplated by the company during 1926, to cost about $785,000.

PHOENIX, ARIZ.—Bids will be received by the Superintendent of Phoenix Indian School, until Jan. 20, for electrical supplies including armored cable, enameled conduit, condulets, fuses, switch plates, etc.

PUEBLO, COLO.—Plans are under way by the Colorado Fuel & Iron Company, Denver, for the construction of a power plant, at its local steel mills, to cost about $500,000. Louis Deesz, 412 Minnequa Avenue, is consulting engineer.

Canada

SAULT STE. MARIE, ONT.—The report submitted by the Public Utilities Commission for an improved street-lighting system has been approved by the City Council.

MONTREAL, QUE.—The Quebec Government has concelled the original contract for the sale Chat Falls, near Ottawa.

Electrical Patents

Announced by U. S. Patent Office

(Issued Dec. 8, 1925)

1,565,006. SAFETY SWITCH; J. F. Burns, Philadelphia, Pa. App. filed June 27, 1922. Rotary snap switch.

1,565,024. PREVENTING CORROSION OF ELECTROLYTIC CONDENSER LEADS; R. D. Mershon, New York, N. Y. App. filed Dec. 23, 1920.

1,565,082. PULL-CHAIN CANDELABRUM SOCKET; E. H. Freeman, Trenton, N. J. App. filed March 25, 1922.

1,565,091. WAVE-TRANSMISSION SYSTEM; E. V. Griggs, White Plains, N. Y. App. filed Feb. 17, 1922.

1,565,092. ATTACHMENT FOR OSCILLATION GENERATORS; H. C. Harrison, Port Washington, N. Y. App. filed June 23, 1921.

1,565,131. SIGNALING SYSTEM; R. S. Wilbur, Lyndhurst, N. J. App. filed July 2, 1921.

1,565,150. OSCILLATION GENERATOR; J. W. Horton, Bloomfield, N. J. App. filed July 9, 1923.

1,565,151. ELECTRIC DISCHARGE DEVICE; W. G. Housekeeper, New York, N. Y. App. filed Dec. 27, 1919.

1,565,152. VACUUM INSULATOR AND ITS ASSEMBLY; W. G. Housekeeper, New York, N. Y. App. filed Nov. 26, 1920.

1,565,155. CARRIER-SIGNALING SYSTEM; J. S. Jammer, New York, N. Y. App. filed Sept. 20, 1923.

1,565,157. CIRCUIT ARRANGEMENT FOR DISCHARGE DEVICES; J. B. Johnson, New York, N. Y. App. filed April 7, 1919.

1,565,165. TELEGRAPH PRINTER; E. E. Kleinschmidt, Chicago, Ill. App. filed June 21, 1920.

1,565,177. METHOD AND APPARATUS FOR COMPARING SOUNDS; D. MacKenzie, New York, N. Y. App. filed April 25, 1922.

1,565,200. METHOD OF MAKING CORES FOR CATHODES OF VACUUM TUBES; H. T. Reeve, East Orange, N. J. App. filed Oct. 12, 1920.

1,565,209. ELECTRIC TOY COOKING STOVE; W. Schwarzenhauer, Eltersdorf, Germany. App. filed Feb. 20, 1925.

1,565,235. SELF-ACTING-TELEPHONE SYSTEM; E. A. Faller, New York, N. Y.

1,565,238. STARTING DEVICE FOR ELECTRIC MOTORS; R. F. Wiedemann, New York, N. Y. App. filed Dec. 8, 1923.

(Issued Dec. 15, 1925)

16,231 (reissue). RADIOPHONE SYSTEM; E. C. Clement, Washington, D. C. App. filed Aug. 14, 1922.

1,565,269. TELEPHONE SYSTEM; H. M. Friendly, Portland, Ore. App. filed March 30, 1922. In which selector switches are employed.

1,565,277. LIGHTING FIXTURE; P. M. Hotchkin, Chicago, Ill. App. filed Aug. 29, 1921. For indirect illumination.

1,565,287. ELECTRIC SWITCH GEAR; J. Mirrey, East Boldon, England. App. filed Dec. 1, 1924. Used in connection with duplex busbar systems.

1,565,302. TWO-WAY REPEATER CIRCUITS; H. D. Arnold, Maplewood, N. J. App. filed Nov. 17, 1919. For transmission of signal currents.

1,565,313, 1,565,314. CIRCUIT CONNECTER; H. A. Douglas, Bronson, Mich. App. filed Oct. 6, 1921. For miniature incandescent lamps.

1,565,316. METHOD OF AND APPARATUS FOR CONTROLLING ALTERNATING CURRENTS; W. A. Eaton, Arlington, Va. App. filed March 25, 1920. Radio signaling.

1,565,321. ELECTRIC CONNECTION; W. A. Frantz, Cleveland, Ohio. App. filed Feb. 16, 1923. For flexible conductor.

1,565,325. MEANS FOR REGULATING MOTORS; J. Herman, New York, N. Y. App. filed Sept. 5, 1923.

1,565,333. ELECTRIC CLOCK; F. J. Seabolt, Schenectady, N. Y. App. filed Feb. 20, 1924.

1,565,334. ELECTRIC CLOCK-SETTING MEANS; F. J. Seabolt, Schenectady, N. Y. App. filed Jan. 2, 1914.

1,565,343. PRINTING-TELEGRAPH-EXCHANGE SYSTEM; G. S. Vernam, River Edge, N. J. App. filed Nov. 10, 1923.

1,565,358. ALLOY FOR ELECTRICAL CONTACTS; L. A. Gardner, East Orange, N. J. App. filed Feb. 19, 1924.

1,565,391. INSTRUMENT STRUCTURE; R. T. Pierce, East Pittsburgh, Pa. App. filed May 12, 1923. Electrical measuring instruments.

1,565,405, 1,565,406. ELECTRODE HOLDER; A. R. Allard, Wilkinsburg, Pa. App. filed Nov. 5, 1920.

1,565,410. RELAY; C. A. Boddie, Pittsburgh, Pa. App. filed May 4, 1920. Polarized relay.

1,565,411. LOAD-REGULATING SYSTEM; C. A. Boddie, Pittsburgh, Pa. App. filed April 14, 1920. For governing the power delivered by a number of supply stations.

1,565,412. MOTOR-CONTROL SYSTEM; E. M. Bouton, East Pittsburgh, Pa. App. filed May 24, 1923. As employed in connection with elevators, planers and similar machines.

1,565,416. ELECTRON TUBE OSCILLATOR; L. W. Chubb, Edgewood Park, Pa. App. filed Feb. 14, 1921.

1,565,417. ARC-WELDING PENCIL HOLDER; O. A. Colby, Irwin, Pa. App. filed Oct. 27, 1920.

1,565,428. TEMPERATURE-CONTROLLING SYSTEM; W. C. Dixon, Wilkinsburg, Pa. App. filed April 7, 1922. For electrical heating furnaces.

1,565,434. PHASE-SPLITTING SYSTEM; C. L. Fortescue, Pittsburgh, Pa. App. filed March 5, 1921. Whereby polyphase apparatus may be operated from single-phase circuits.

1,565,441. AUTOMATIC VOLUME REGULATION OF TRANSMISSION SYSTEMS; H. S. Hamilton, New York, N. Y. App. filed Sept. 3, 1924. In a signaling system.

1,565,455. SWITCH MECHANISM; H. G. Hoke, Stillwater, Okla. App. filed June 16, 1922. Safety type.

1,565,462. ELECTROMAGNETIC TOOL; N. Japolsky, London, England. App. filed Jan. 13, 1925. Hammer or like reciprocating tool.

1,565,465. BAR HANGER; J. F. Kearney, Chicago, Ill. App. filed Nov. 17, 1922. For supporting outlet box.

1,565,466. FURNACE-RESISTOR MOUNTING; A. D. Keene, Pittsburgh, Pa. App. filed Nov. 20, 1923.

1,565,468. SELECTIVE MECHANISM; E. E. Kleinschmidt, Long Island City, N. Y. App. filed Feb. 7, 1923. For motor control, etc.

1,565,470. SWITCH MECHANISM; H. K. Krantz, Wilkinsburg, Pa. App. filed Aug. 25, 1923. Safety type.

1,565,477. VACUUM-TUBE STABILIZING MEANS; D. G. Little, Edgewood, Pa. App. filed March 1, 1922.

1,565,478. RADIO TRANSMITTER; D. G. Little, Wilkinsburg, Pa. App. filed April 6, 1923.

1,565,486. ELECTRIC CONNECTOR; B. F. Moody, Detroit, Mich. App. filed April 8, 1925. For appliances.

1,565,491. VOLUME CONTROL OF TRANSMISSION; H. Nyquist, Jackson Heights, N. Y. App. filed Sept. 13, 1924.

1,565,499. SAFETY SWITCH FOR ELECTRIC IRONS; T. A. Reid, Wilkinsburg, Pa. App. filed Dec. 7, 1921.

1,565,500. ELECTRIC VAPORIZER; E. Ritter, New York, N. Y. App. filed Dec. 3, 1924.

1,565,505. RADIO TRANSMITTER; F. M. Ryan, East Orange, N. J. App. filed Aug. 14, 1924.

1,565,507. TELEGRAPH SYSTEM; E. S. Sandberg, Indianapolis, Ind. App. filed May 23, 1924.

1,565,508. DUPLEX METHOD OF AND APPARATUS FOR SENDING TELEGRAPHIC MESSAGES; E. S. Sandberg, Harrisburg, Pa. App. filed Sept. 4, 1920.

1,565,519. APPARATUS FOR MAGNETIC SPRING TESTING; T. Spooner, Edgewood Park, Pa. App. filed April 21, 1921.

1,565,521. SECRET-COMMUNICATION SYSTEM; J. S. Stone, San Diego, Cal. App. filed Dec. 8, 1920.

1,565,522. CARRIER-CURRENT MULTIPLEX-SIGNALING SYSTEM; J. S. Stone, San Diego, Cal. App. filed Nov. 23, 1923.

1,565,530. MERCURY-VAPOR SPARK GAP; P. Thomas, Edgewood, Pa. App. filed Aug. 18, 1921.

1,565,531. LOCOMOTIVE TRANSFORMER; A. W. Thompson, East McKeesport, Pa. App. filed Oct. 15, 1923. For use in connection with electric locomotives.

1,565,539. ELECTRIC SPACE HEATER; J. C. Woodson, East Pittsburgh, Pa. App. filed Oct. 27, 1923.

1,565,540. AUTOMATIC VOLUME REGULATION OF TRANSMISSION SYSTEMS; S. B. Wright, East Orange, N. J. App. filed Sept. 3, 1924.

1,565,544. RADIO-TRANSMISSION SYSTEM; R. Bown, Wyoming, N. J. App. filed Sept. 18, 1924.

1,565,546. MOTOR STARTER AND CIRCUIT CONTROLLER; A. W. Burke, Pelham Manor, N. Y. App. filed Aug. 13, 1921. Functioning automatically to open the motor circuit under abnormal conditions.

1,565,548. ARRANGEMENT FOR CONTROLLING VOLUME RANGE; A. B. Clark, Brooklyn, N. Y. App. filed June 19, 1924. In the transmission of signal currents.

1,565,555. ARRANGEMENT FOR AUTOMATICALLY CONTROLLING VOLUME OUTPUT; C. H. Fetter, Millburn, N. J. App. filed July 11, 1924. In the transmission of signal currents.